People & the Planet

IPPF, UNFPA, IUCN

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Water for life

Partners for change

People & the Planet **is a joint publication of the United Nations Population Fund, the World Conservation Union and the International Planned Parenthood Federation. It is published by Planet 21, an independent, non-profit, publishing company, in association with a wide range of international organizations which have an interest in various aspects of population, environment and development, and with funding support from the Swedish International Development Authority.**

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■ *The next issue of* **People & the Planet** *looks at people and wildlife. It reports from around the world on success stories in sustaining biodiversity.*

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Editor: John Rowley

Associate Editor: Jeremy Hamand

Administrative Assistant: Janet Abbott

Contributing Editors: Paul Harrison. Don Hinrichsen, Norman Myers

Correspondents: Stewart Fraser (Australia), Gamini Seneviratne (Austria), Shahadat Chowdhury (Bangladesh), Xiong Lei (China), Sarita Kendall (Colombia, Ecuador), Wagdi Riad (Egypt), Ajoa Yeboah-Afari (Ghana), Susan Mulley (Hong Kong), Francis Mwanza (Italy), Bishakha Datta (India), Margot Cohen (Indonesia), David Nowlan (Ireland), Sujaya Misra (Kenya), Aliou Diongue (Mali), Elizabeth Obadina (Nigeria), Saneeya Hussain and Javed Malik (Pakistan), Paul Icamina (Philippines), Helena Marques (Portugal), Mallika Wanigasundara (Sri Lanka), John Bland (Switzerland), Yuli Ismartono (Thailand), Nuray Fincancioglu (Turkey), Winthrop P. Carty (United States).

Design: Zoë Davenport

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People & the Planet

Running out of water

Ours is a water planet. Spread evenly over the globe, water would cover the whole surface to a height of 2.5 km. The whole of the planet's land surface could be fitted into the Pacific Ocean with plenty of room to spare. Yet only 3 per cent of that water is fresh, not salty, and 99 per cent of that freshwater is locked up in icecaps and glaciers, or underground. Only 1 per cent of freshwater is relatively easily available for use.

Even this amount, if evenly distributed around the world and rationally used, would be enough to sustain twice or three times the world's current population. Unfortunately freshwater is very unevenly distributed and is wasted everywhere. In terms of water, there is no North-South divide; only the water 'haves' and the 'have nots'.

Definitions vary, but according to one estimate, over one-third of humanity, or 2 billion people, live in critically water-short regions. These include most of Africa, the Middle East, much of South Asia, along with a large portion of the western United States and northwest Mexico, parts of Chile and Argentina, and nearly all of Australia. By the end of the decade, population growth and escalating per capita demand, will severely squeeze water resources in many countries already facing shortages. By 2025, with the global population growing by some 3.5 billion, some experts predict that over 90 countries will be experiencing shortages. At the same time, the quality of the planet's water is being degraded. In 1980, the world generated around 1,900 km^3 of wastewater: a figure which is expected to more than double by the end of the century.

Shortages and pollution are one aspect of the water crisis. Access to clean drinking water and to sanitation is another. As the opening articles in this issue make clear, the global effort made in the 1980s to provide services to all achieved a great deal, but it still left 1,200 million people without access to clean water and 1,800 million without sanitation.

The positive message to emerge from this issue of *People & the Planet* is that solutions to the growing water crisis do exist. But, as Sandra Postel spells out, they require a new ethic in our approach to water. Technologies exist which can cut the waste of water by agriculture and industry by huge amounts. Cities, too, can do much to use water less wastefully as Jerusalem has shown. Wetlands can be managed for people and nature, rather than dammed and drained without sufficient thought for either: a matter of particular urgency for Africa, as Patrick Dugan explains. Wastewater can be put to productive use. Domestic water and sanitation can be supplied at a lower price than the cost to governments of dealing with the epidemics and disease caused by their absence. And population growth can be slowed by providing choices over childbearing to women which will contribute to health, productivity and family wellbeing. What we do not have is time to waste in tackling these positive initiatives – together.

John Rowley

NEWS FILE

Migrant pressures

The likelihood that industrialized countries will be confronted with an unprecedented influx of would-be immigrants over the next few decades was a central discussion point at the European Population Conference, held in Geneva in March.

The meeting, jointly sponsored by the UN Economic Commission for Europe, the Council of Europe and the UN Population Fund, was told that demand to migrate to the West has been estimated at 60 million persons. Mr David Coleman, from Oxford University, said in a paper commissioned for the meeting, that Western Europe and North America face increases in migration pressures of between one and two million entrants a year, mainly from the Third World.

He pointed out that while Europe's population would grow by only 4 million between 1991 and 2025, that of the south-east Mediterranean would grow by 158 million, tropical Africa by 826 million and South Asia by 920 million.

Dr Nafis Sadik, Director of UNFPA, said that more than two million immigrants are believed to have entered Europe and North America in the last two years and that pressures from Russia could intensify westward migration from the east. Other UN officials and economists in Geneva argued that migration would spur industrialized countries to pay more attention to world population growth.

Whether Europe actually needs migration to restore its labour supply or to compensate for population ageing was demographically dubious, Coleman argued. Only a higher birth rate among the indigenous population could restore these deficiencies, he said. And only about 60 per cent of Western Europe's potential workforce is actually working. So there was plenty of slack.

In fact, fertility rates in Western Europe now average only about 1.7 children, the meeting was told, with Italy and Spain having rates of only 1.2, below the former West Germany's rate of 1.4, and well below replacement level of about 2.1.

But there was no reason to be too fearful of migration pressures, according to Mr Jan Pronk, Netherlands Minister for Development Co-operation. Foreign migrants had enriched Europe in many ways over the centuries. Many European were frightened by sheer numbers, but fear was a bad adviser. The need now was for a "comprehensive immigration policy aimed at regulation, rather than prohibition". There was also a need to address the root causes of the problem: "demographic pressure, ecological distortions, economic inequalities, political instability, violation of human rights."

The emphasis in the recommendations agreed in this regional meeting, held in preparation for next year's International Conference on Population and Development in Cairo, was on 'international responsibility' and 'international co-operation'.

Goals for Africa

A Declaration on Population, Family and Sustainable Development, agreed at the African regional preparatory meeting in Dakar, in December, calls for a reduction in the region's population growth rate from 3 per cent to 2.5 per cent by the year 2000. It also calls for a doubling of the contraceptive prevalence rate from 10 to 20 per cent in the same period.

It says life expectancy should increase from 51 years to 55 years. It sets goals for reducing infant mortality to below 50 per 1,000 live births and childhood mortality to 70 per 1,000. It says countries should also aim to reduce maternal mortality by half.

In a decision which reflects what is certain to be a central concern of the Cairo conference, the Declaration calls upon governments to adopt national policies to improve the role, status and participation of women, and to take the necessary steps to eliminate discrimination against women, as well as certain traditional and cultural practices which inhibit their advancement.

■ *The Non-Governmental Organizations' Planning Committee for ICPD is setting up a steering committee to plan for the NGO Forum in Cairo, to negotiate the terms of its participation in the conference itself and to stimulate NGO involvement. For more information contact the Planning Committee care of Population Communications International, 777 UN Plaza, Suite 7C, New York, NY 10017 (Tel: (212) 687 3366 or Fax (212) 661 4188.*

Falling fertility

At current rates, Indonesian women will have an average of three children during their reproductive years, according to the latest Demographic and Health Survey report. This is a decrease of 46 per cent since the early 1970s. Knowledge of modern family planning methods is virtually universal in Indonesia and half of all married women are using them.

The findings are encouraging for Indonesia, which is the fourth most populous country, with 180 million people. "As a result of strong, sustained government support, Indonesia has made substantial progress towards its goal of reducing the birth rate, establishing the small family norm, and improving the health of mothers and children," said Dr Ann K. Blanc, technical adviser to the survey.

The trend to later marriage has contributed to the sharp decrease in fertility. Whereas older women first married at about 17, younger women are waiting till they are almost 20.

The study indicates that Indonesia has also made progress in improving the survival chances of young children. Infant mortality is down to 68 per 1,000, from 142 in 1970, and nearly half the children between 12 and 23 months have been fully immunized against the major childhood diseases.

The survey findings confirm the message of the last issue of *People & the Planet* that women with more education are more likely to plan their families and have healthy children. Fifty-nine per cent of women with secondary education are using a modern contraceptive method, but only 37 per cent of women with no education are doing so.

There are also substantial differences in fertility rates between regions: total fertility rates in Java and Bali are 2.7 children, compared to 3.5 children in the other islands.

In spite of the successes, there are indications that fertility could be even lower in Indonesia. Survey evidence suggests that about 22 per cent of recent births were wanted later than they occurred, or not wanted at all. An estimated 13 per cent of

women have an unmet need for family planning.

■ *The Indonesian DHS report, in summary or complete forms, is available from: Macro International, DHS Division, Publications, 8850 Stanford Boulevard, Suite 4000, Columbia, MD 21045, USA.*

Controlling dengue

A Thai grass roots programme encouraging villagers to keep their water storage jars covered has proved extremely effective in eliminating the dengue vector *Aedes aegypti* mosquito, *Susan Mulley reports*.

Dengue fever is a significant problem in Thailand, having spread from Bangkok to the rural communities with more than 100,000 cases recorded annually, according to Dr Pattamaporn Kittayapong of the Department of Biology at Bangkok's Mahidol University.

Routine control with insecticides had proved ineffective, following on the heels of dengue fever cases rather than preceding them, as well as being expensive and unpopular at the local level.

In conjunction with Dr Daniel Strickman of the Department of Entomology at the Armed Forces Research Institute of Medical Sciences also in Bangkok, Dr Kittayapong and her team conducted intensive larval surveys in four rural/suburban villages in Chachoengsao Province 80 kilometres from Bangkok. The surveys revealed that water jars were the most common and most important breeding sites of *Aedes aegypti*.

Water jars are used for various purposes and usually have standard metal covers. The survey showed that jars with metal covers were 51.2 per cent free of *Aedes* larvae compared to 34.1 per cent for uncovered jars. Further investigations showed that while a standard metal cover could reduce the number of *Aedes* larvae in jars, it did not prevent the development of the larvae.

"The purpose of the water jars and water use habits were observed in order to develop new effective covers for jars," Dr Kittayapong said. Three

different kinds of shower-cap type covers which matched water-use habits were developed to ensure acceptance and sustainability.

Both laboratory and field experiments confirmed the effectiveness of the covers which proved 100 per cent effective when properly used, she said. Dengue infections in the "treated" villages were reduced from 11 per cent and 22 per cent to 0.4 per cent, Dr Kittayapong said.

Educating girls

Following our special report on educating girls comes news from the World Bank of a $68 million credit to Bangladesh to help an extra 300,000 girls in Bangladesh to get secondary education.

The credit, approved by the International Development Association in March, will largely be used by the government to provide stipends to cover tutition, examination costs and a large part of the money charged for textbooks, stationary, uniforms and transport.

At present, only about one girl in seven between the ages of 11 and 16 is enrolled in school, as a result of which "about half the country's population is excluded from participating in Bangladesh's development", says Paula Valad of the Bank's South Asia Region.

The Bank's credit will also help to hire women teachers, to provide separate lavatories for girls in some schools, and to publicize the importance of educating girls. Some girls, completing schooling, will also be taught skills they can use to help them get jobs.

■ *The World Bank has issued a cross-national study entitled Social Gains from Female Education, which draws attention to the importance of secondary education in reducing fertility, among other benefits. Price: $6.95.*

Forced evictions condemned

The UN's leading human rights policy-making body has unanimously condemned the practice of forced evictions as a "gross violation of human rights" and has urged governments to stop removing people from their homes against their will. The decision is especially relevant to large-scale development projects such as large dams and strip mines which have displaced millions of people over the past three decades.

Big projects in the pipeline threaten to displace another 1.5 million people, but funding agencies and governments will now come under increasing pressure to think again about forced resettlement schemes, in the light of the UN decision. The World Bank-funded Sardar Sarovar dam in India is seen as a test case – a decision on whether the project will go ahead is imminent.

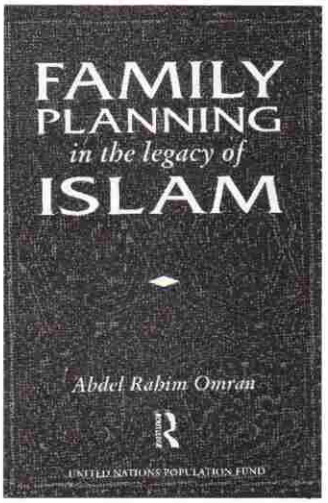
Meeting in Geneva,in March, the UN Commission on Human Rights – composed of 53 governments – directed the UN Secretary-General to compile a study on the practice of forced evictions to be considered by the Commission next year. It is anticipated that this will point to the need for increased UN action on forced evictions.

■ *A briefing document on forced evictions prepared by the Panos Institute, Forced to Move, is available from Juliet Heller, at the Panos London office, telephone (4471) 278 1111, Fax (4471) 278 0345 or email panoslondon.*

Legacy of Islam

A new book, *Family Planning in the Legacy of Islam*, by the reknowned Islamic scholar Professor Abdel Rahim Omran, Chief Population Adviser to Al-Azhar University in Cairo, goes a long way to dispelling the myth that Islam is inherently opposed to family planning and fertility regulation. Professor Omran spent five years researching and writing the text, which covers 1,400 years of religious pronouncements on the subject of birth control, with many references from the Koran itself. At the request of a number of Arab countries, the United Nations Population Fund helped underwrite this ambitious undertaking.

Since the book is a work of scholarship and therefore 'neutral', it does not contain any conclusions. The closest thing appears on page 238, where the Grand Imam of Al-Azhar University proclaims



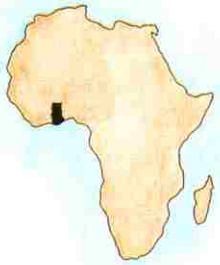
seven points about Islamic law and family planning: 1) There is no text in the Koran prohibiting prevention of pregnancy; 2) pregnancy prevention is not killing; 3) modern [birth control] methods are, by analogy, permissible; 4) temporary sterilization is permissible, but permanent is not; 5) abortion after 120 days is prohibited except to save the mother's health; 6) artificial insemination with the husband's sperm is allowed; and 7) no law should coerce people to use contraception or to fix the number of children.

There is one important question the book does not answer. Why, if Islamic tradition is so tolerant of family planning, is there so much opposition to it in Islamic countries?

■ ***Family Planning in the Legacy of Islam**, by Abdel Rahim Omran is available from Routledge, London and New York, 1992, £40.*

Dying for water

Water dominates the life of many people in the world's less developed countries. This is especially true in Africa, where rural water supplies are often unpredictable. Here, three of our African correspondents report on the lives of women who endure the daily search for clean water. Our first report, from Ghana, is by *Ajoa Yeboah-Afari*.



It is 4 am and dawn has not yet announced itself, but for the women and children of the Ghanaian village of Danchira, the day's work has already started, and top of the list is the daily trek for water.

Dede Aryehteye is one such woman, and with a big basin balanced on her head she sets off, heading in the opposite direction from the village's three ponds and bore-hole stand which have all dried up due to the uncertain rainfall in recent years. As she and the other villagers have been doing on and off for the past five years, since the water problem worsened, Dede Aryehteye treks to a location about five miles away, where there's a tributary of River Densu, one of Ghana's main rivers.

It will be about 8 am by the time Aryehteye returns with her precious head load of water. She will then spend the next hour or so filtering the dark, tea-coloured water with the filtering device that the national Guinea Worm Eradication Programme supplies free of charge. Filtering the water ensures that the guinea worm larvae do not end up in the stomachs of those who drink the water and thus infect them with the debilitating disease that confines sufferers to their beds for months. She had been a guinea worm victim in the past, but since she started filtering her water, she had been freed of the affliction.

After double-filtering the water, she divides it into three: one is put into a small barrel and stored in her hut for drinking, the second is for household use, and the third is just enough for her evening bath. The morning bath is taken at the riverside. Similarly, if there is laundry to be done, it is tied in a bundle and strapped to the back for the trek to the riverside where it is washed.

When the filtering is completed, Aryehteye can sweep her home and do other domestic chores. The morning is well-advanced by the time she's ready to set off for her cassava farm, and sometimes by this time she's too exhausted to go to the farm. "Water hunger is killing us here," Dede Aryehteye told a visitor recently. "Tell the government to help us. Nothing goes well when water is scarce... one should go to the farm early in the morning when it's cool, and the sun hasn't come out in full force and one can do some work – weed or plant. Now having spent almost half the morning fetching water, how much of the day is left for farming or other activities?"

Dede Aryehteye, aged about 55 and a mother of five, lives alone in her hut with her last child, a 15-year old son who is an elementary school pupil. He usually fetches water for her, but when he goes to visit his father in a nearby village, as he's done today, she has to fend for herself. On weekdays when the children eventually make it to the classroom they are worn out by water-fetching.

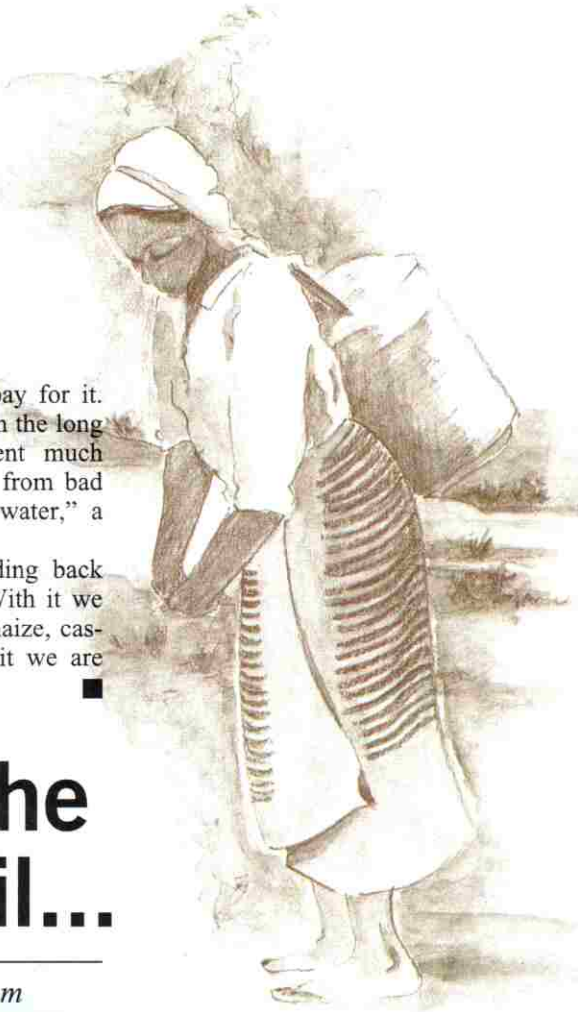
Danchira is a village about 35 miles away from the capital of Ghana, Accra, off the busy Winneba Road. Almost all the villagers are farmers, growing foodstuffs. Currently it has a population of about 500, the majority being children. Aryehteye said that had it not been for the water and related problems, Danchira would have a much bigger population. She said the water problem was the reason why most of the young people had left the village. Her elder children have all made Accra their permanent home. She added with a chuckle that there were times when she herself got so fed up with the water problem that she too packed a bag and left for the city for a rest. The zonal Guinea Worm Co-ordinator, Mr Masaoud Aryee, believes the population could be as many as 6,000, judging from the crowds that filled the village when there was a funeral.

Dede Aryehteye says that in past years there was no problem of ponds drying up. However, for the past five years or so rainfall has been uncertain. The three village ponds are now just indented areas overgrown with weeds. The village's sole bore- hole is similarly surrounded by a thicket of high weeds from its long period of disuse. "You pump and pump and not a drop of water comes out. There's simply no water in the ground," she said.

The bore-hole is not the only evidence of official effort to help solve the Danchira water problem. A few steps from Aryehteye's hut, in the middle of the village, stands a huge water tank that the Ghana Water and Sewerage Corporation put there a few years ago, when the water scarcity began. A tanker was supposed to come from the city regularly and fill the tank for the villagers' use. However, after a couple of trips the service stopped, because the corporation apparently found it too expensive, and the vil-

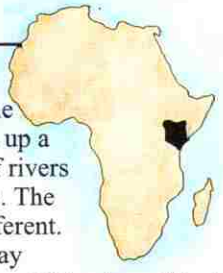
lagers could not afford to pay for it. "The authorities forget that in the long run it costs the government much more when people fall sick from bad water, than providing free water," a health worker pointed out.

Scarcity of water is holding back farming, Aryehteye said. "With it we can grow everything here, maize, cassava, vegetables. Without it we are dying." ■



When the rains fail...

Sujaya Misra reports from Kenya



Kibwezi. The name conjures up a vision of rivers and pretty valleys. The reality is very different.

Located half way between Nairobi and Mombasa this is 'drive past' country: six out of ten seasonal rains fail here. Drought and famine affect everyone.

The area is quiet as we walk. The vegetation sparse and scrubby. We left Nairobi at 5 am, but already now the sun is getting high, warning of the heat to come. We see boys on bikes, water containers strapped to their backs. Cylindrical beehives hang on the trees. When we get to the well there is no one around.

A big lock and chain hang over the handpump. Large cans are lined up waiting for the chairman to arrive with the key, for the twice daily session. That is to prevent the precious water being wasted, from this or any other of the hundred shallow wells which have been created as part of a project by the African Medical Research Foundation in this 100 km^2 region.

In the distance we see a woman with a strap around her forehead supporting a large can of water. Bent double, it is difficult to judge her age. She says her name is Mbekiga Kimulu. She does not come far for water: "Only two kilometres."

It seemed a very long way to me. Each container can take 20 litres of water and each litre weighs one kilogramme. "Before the well was built we used to walk to the river which is 5 or 6 kilometres away."

Mbekiga has six children. For the family of eight she fetches three containers a day. These 60 litres are used for washing the family, for drinking, cooking and cleaning. In a dry season they manage on two containers.

She and her husband work a small plot of not very fertile land on which they grow maize and beans. They rely entirely on rain to grow their crops. What happens when the rain fails? "We cut the trees and sell charcoal. We get 25 shillings a bag for it."

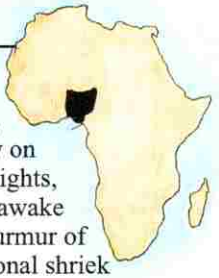
How do they possibly manage, I wonder. But instead ask what happens when the children fall sick. "We go the hospital, its free." And also an eight-kilometre walk away. Asked if the children often get sick, there is an awkward silence. Two of the children died, it seems, quite a long time ago.

Do the children get sick a lot? "Well they get malaria, maybe, and stomach problems, that is all."

It is 7 pm by the time we get home. Suddenly I feel I am the richest person alive. I have piped water. ■

The path to the stream

Elizabeth Obadina reports from Nigeria



Around midnight, especially on moonlit nights, Sarah Barrah lies awake listening to the murmur of voices and occasional shriek of merriment which drift up to her compound in Umuku, in Eastern Nigeria. This is the cool time favoured for bathing and fetching water.

Sarah rarely joins the centuries-old

water procession as nowadays there's only herself and her 12-year-old grand-daughter, Cecilia, to look after. Rainwater, stored in oil drums, meets most of their needs. Cool stream water for drinking and cooking is collected before breakfast or after school by Cecilia, balancing a four-gallon plastic can on her head.

"We pay water rates, we pay taxes, we paid our share for electricity too, but the electricity lines stop half a mile outside Umuku," complains Sarah, whose husband and five sons have been forced to seek work and secondary schooling away in Lagos and Port Harcourt. "There's nothing for them here," she says.

She, herself, survives on the 10 dollars worth of provisions which her husband usually manages to send home each month, eked out by gari from the cassava which Sarah and her granddaughter grow.

Sarah's husband would like her to move to Lagos, which despite high rents and manifold problems possesses more amenities to make life easier for a couple in their advancing years (60 per cent of the city's population have access to piped water, for example, and the World Bank is busy helping with a $500,000 water supply project).

"In Lagos there is work, water and light. Provisions are cheaper. But if I leave the village, thieves will take over the house and the land," says Sarah. Things are specially bad before each New Year's yam festival, she says, when kidnappers come south looking for human heads to make juju.

Sarah, one of 84 per cent of Nigerian countryfolk who rely on streams and rivers believes Umuku people are lucky to have a clean, cool stream. But her husband is not so sure.

"Nowadays, even the streams are being spoilt for poor people," says Mr Barrah, who blames pollution from Aba, a poorly-regulated industrial centre 20 miles away, for the state of Umuku's second stream. But he says it is poor farm prices and lack of job opportunities which are forcing people to leave the village.

"We must live where the money is," he says. But whether his wife will join him is a moot point. ■

The cost of dirty water

The health consequences of dirty water are so all-pervading that they defy efforts to draw up a global balance-sheet. Take Peru: in the first 10 weeks after a cholera epidemic broke out in January 1991, the World Bank estimated losses from reduced agricultural exports and tourism at US $1,000 million – over three times what the country had invested in water supply and sanitation services during the 1980s. Yet the most common water disinfectant, chlorine, is very effective against *Vibrio cholera*, and if readily available would cost an average family between 25 cents and $2 per year. According to WHO, ensuring safe water supply and sanitation throughout Latin America – the long-term answer to cholera – calls for a total capital investment of some $5,000 million a year over the next 10 years.

Cholera is only one of a great many waterborne or water-related illnesses. The diarrhoeal diseases alone kill about four million people a year, of whom 80 per cent are children. Many of those lives could be saved by treatment with oral rehydration salts – ORT – which are made widely available in the Third World by international agencies and cost as little as 20 per cent per treatment. In 1991, almost 40 per cent of cases of diarrhoea in children were treated with ORT, averting about one million unnecessary deaths. On the other hand, WHO estimates that each year between $1,000 and $2,000 million are wasted on inappropriate treatment of diarrhoea and respiratory infections.

In Sub-Saharan Africa alone, the indirect cost of malaria amounted to $800 million in 1987, but by 1995 is expected to reach $1,800 million. Worldwide, over one million people die each year and about 280 million are infected, so the cost must be measured both in lives lost and in working hours lost through illness. Community campaigns can be effective in destroying standing pools of water where the mosquitoes breed that transmit malaria to humans. But government expenditure is crucially needed to foster such campaigns, to underline the value of impregnated bed nets and to provide medical treatment.

Then there is schistosomiasis, transmitted by a watersnail living in standing water where humans work, play – and urinate. Found in 76 countries, this disease kills some 200,000 people every year but debilitates another 200 million, thereby putting a serious brake on each country's economic advancement. An effective drug – praziquantel – exists, whose price may not appear very high – around US $1 to treat one patient. But Kenya, Malawi, Nigeria and Zambia together have more than 30 million infected people; treatment even at that price would cost as much as their total health budgets for a year.

JIM HOLMES/OXFAM

Washing at a well in northern Cambodia.

Onchocerciasis has long plagued huge tracts of West Africa. The last six-year phase of a control programme that began in 1974 is starting this year. Hinging on efforts to reduce the number of blackfly which transmit 'river blindness', this phase alone will cost $175 million. Huge as this may sound, it amounts to under $1 per person protected per annum.

Transmitted by drinking water containing a parasite, guinea worm disease causes painful blisters, usually on the leg, preventing the victims from working or – in youngsters – from attending school. The economics of this disease must take into account its effects on the health, agriculture

MARK EDWARDS/IPPF

and education in endemic areas. Merely to filter drinking water is a cost-effective means of preventing guinea-worm and WHO is working with governments and NGOs to eradicate this disease by1995.

Few developing countries seem willing to draw up a simple balance sheet. On one side, the human and financial cost of water-related diseases in terms of lives lost and man-hours of work wasted; and on the other side, the expense of ensuring clean water and proper sanitation for all citizens. Undoubtedly, the first column would prove costlier. ■

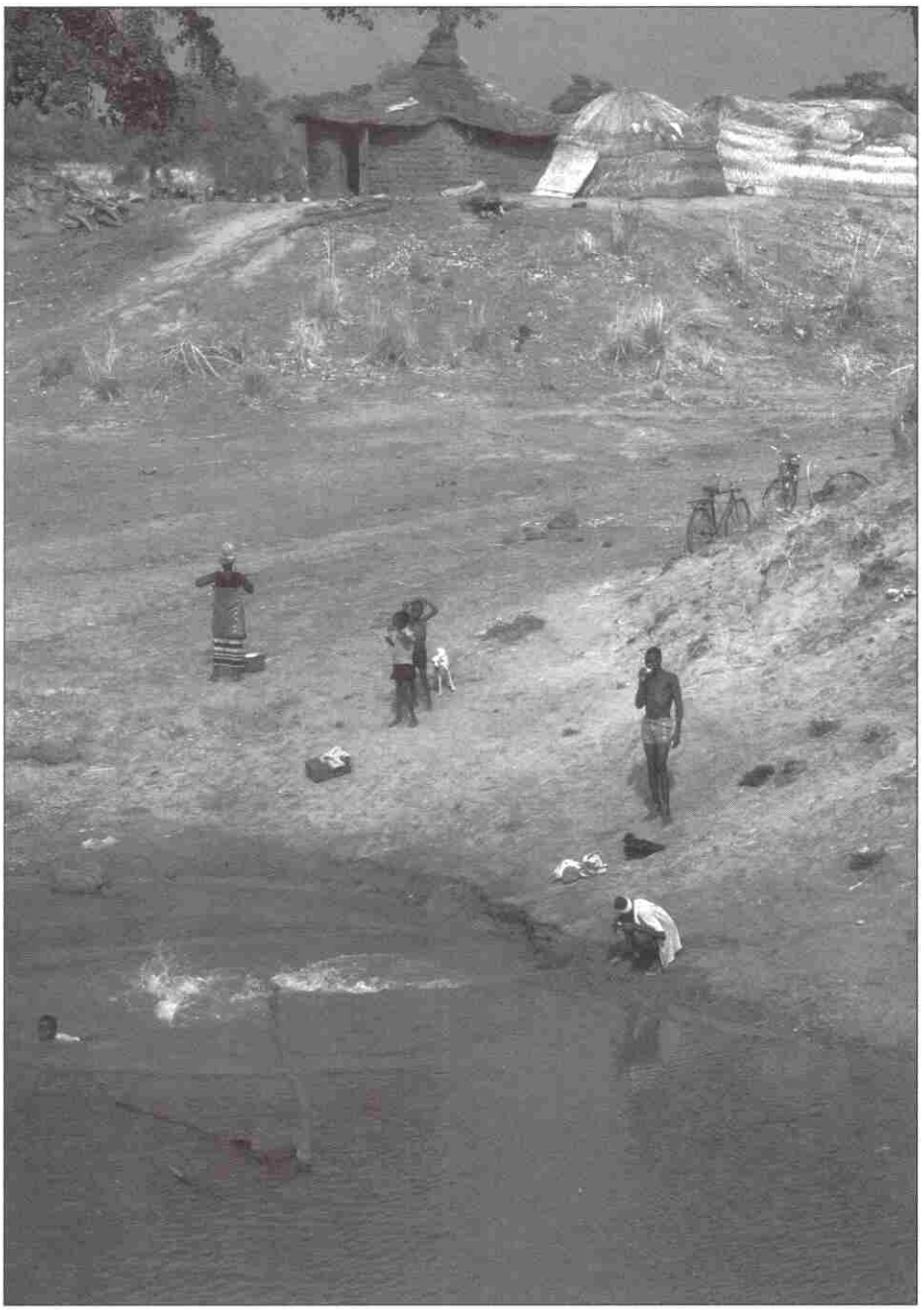
The Water Decade

"Now here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!" This advice, given by the Queen to Alice in *Through the Looking-Glass*, unfortunately sums up the position of the International Drinking Water Supply and Sanitation Decade, 1981–1990 (IDWSSD).

On 10 November 1980, the UN General Assembly proclaimed that the primary goal envisaged for the Decade was the attainment of full access to water supply and to sanitation by all inhabitants in the developing countries by the year 1990. According to official UN estimates, about 75 per cent of urban populations and 34 per cent of rural populations in the developing world had access to safe water supplies, while 60 per cent in the cities and 31 per cent in the countryside had sanitation facilities; in other words, some 1,700 million lacked a water supply and over 1,900 million were without sanitation. Dr Halfdan Mahler, then Director-General of WHO, pointed out that – since 80 per cent of all diseases are linked with unsafe water – the number of water taps per 100,000 population are a better indicator of health than the number of hospital beds.

As early as 1983, the targets had been trimmed; the decade now aimed at 100 per cent cover for water supplies but only 80 per cent for urban and 50 per cent for rural sanitation. More trimming followed.

At the end of the Decade, according to the IDWSSD's own End of Decade Review (as at December 1990), it had provided access for an estimated total of 1,200 million people to safe water supplied, and sanitation facilities for some 770 million; 85 per cent of the population in the cities of the developing world were now served by improved, more accessible, safer water supplies, but only 59 per cent of country dwellers. In the cities, 74 per cent now had adequate sanitation but in rural areas only 40 per cent.



DAVID REED/PANOS PICTURES

People can live near this river in Burkina Faso again now that river blindness has been eradicated there.

This was no mean achievement. Yet despite these major accomplishments and the investment of US $134,000 million, more than 1,200 million people (30 per cent of the developing world's population) still lacked access to safe water and some 1,800 million (over 40 per cent) were still without adequate sanitation.

Various factors, including limited financial resources, inadequate operation and maintenance, the low level of public awareness about health and the rapidly rising population (a 42 per cent population increase in the cities over 10 years) all combined to defeat the idealistic goals of the Decade.

A broad consensus has since been reached by those countries and the external support agencies to continue the thrust of the Decade beyond 1990 and to harness the drive to the goal of "Health for all by the year 2000".

Whole armies of people – nationals of the countries concerned, volunteers from charitable and non-governmental organizations and officials of governments and international agencies – put an admirable effort into trying to attain the goals of the Decade. Unfortunately, the fact that results fell so far short of the targets lends weight to the argument that International Decades, Years and Days have only a short-lived effect and that, once they are over, the world returns to its complacent acceptance of the status quo. ■

John Bland

Regional water scarcity - a widely

The global population is now over 5.5 billion, increasing by about 95 million people *every year*. Most of this growth is taking place in the poor countries of the developing world. The issue of feeding these extra people – the equivalent of adding another Mexico or Nigeria to the planet each year – will have to be seriously addressed in the near future.

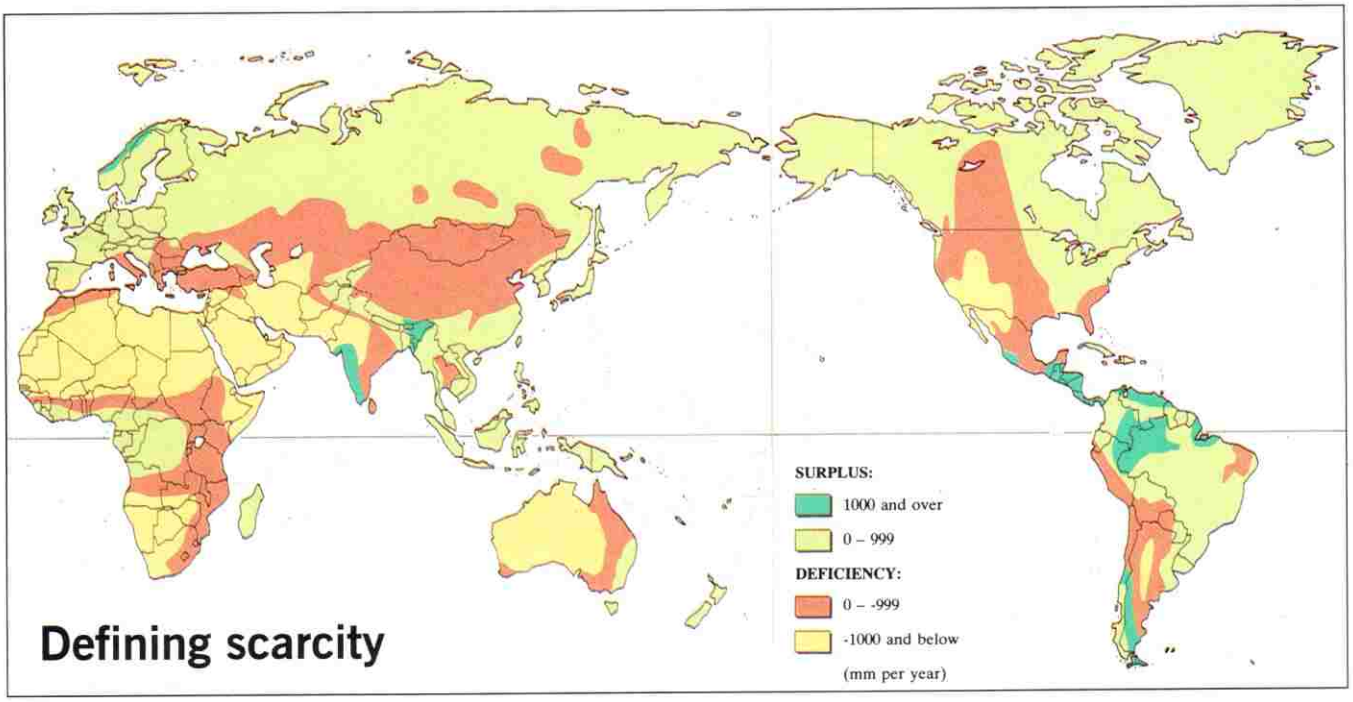
Human life depends on continuous access to two things: freshwater and food resources. Crop production, however, is critically dependent upon huge amounts of water passing through the plant from its roots out through the foliage.

The conventional approach to water supply problems in the developed North is: How much water do we need and where do we get it? Unfortunately, this approach is inadequate in poverty- stricken regions – for example in Sub-Saharan Africa and southern Asia – where water may very well be a limiting resource. The evident question to ask is: How much water is in fact moving through the landscape above and below the ground surface, and how to best benefit from the available amount?

In essence, a country's available water consists of the non-evaporated rainfall over its territory. In addition, some water may be imported through aquifers and rivers.

The dilemma of Southern water-short countries is fivefold: they have intermittent wet and dry seasons; the main part of the year is often dry; recurrent drought years are part of the climate; vulnerable soils are erodible or impermeable, leading to land desiccation; and the recharge of aquifers and rivers is low since most rainfall evaporates.

These conditions complicate the achievement of self-reliance in food production, especially in those countries with rapidly growing populations. Securing crop yields depends on ade-



Defining scarcity

ATLAS OF THE ENVIRONMENT

Water will increasingly become a constraint on economic and social development. This will impact most on countries with limited water supplies, rapid population growth and/or fast-expanding industry and agriculture. With poor management this can result in over-exploitation and pollution.

Regions of water scarcity can be defined as those with more than 600 people for every million cubic metres (MCM) of available water per year. At present 300 million people are living in such regions. By 2025 3 billion people will be affected – a tenfold increase.

In 1990, 26 countries including most of North, East and Southern Africa and the Middle East, fell in this category. By 2025, 65 countries will be water-short, according to this definition, including India, Korea, Nigeria, Peru and Poland. Others will suffer from localized shortages.

To maintain today's water use per capita, the amount of water mobilized would have to increase by 1,500,000 MCM. That is equivalent to all the water in the reservoirs of the world's 10 largest dams (excluding Owen Falls).

Irrigation accounts for about 70 per cent of the world's total water use. In the dry developing countries farmers need to use more water than in the humid tropics for the same biomass yield. In the past 40 years, irrigated cropland has tripled. But farmers usually obtain this water at a fraction of the actual cost, often leading to wastage. Good irrigation techniques, skilfully used, not only save water they also cause less damage.

In the map above, the surplus areas can support a wide range of crops and vegetation without irrigation. In the deficit areas, they cannot.

Mikael Arnestrand ■

neglected challenge

quate root-zone water security. Since rainfall is erratic, this calls for specific measures: either protective irrigation or careful, integrated soil-water management.

The challenge for water-short countries is to cope with vulnerable soils, short growing seasons, and a constant risk of droughts. In addition, the best possible use has to be made of the limited amount of water available in aquifers and rivers. In Africa this is often less than 100 mm per year.

Hence, development in low income countries is a completely different issue from development in temperate zones. The conventional water management approach is poorly adapted to the prevailing conditions in the dry tropics. What is needed instead is an integrated approach to land and water. The rationale for integration is that land use is both water-dependent and water-impacting.

For example, the runoff of water is influenced by forestry and land use practices in each country. The more rainwater that is consumed for tree growth and crop production and returned to the atmosphere through photosynthesis, the less will remain to feed aquifers and rivers. The importance of this phenomenon is well known in countries with a high evaporative demand, such as Australia and South Africa; where runoff is extremely sensitive to vegetation changes, even forest fires. In the same way, imported water is vulnerable to changes in biomass production upstream.

Also, water is a mobile solute and chemically active. It picks up soluble pollutants along its pathways through the landscape.

A critical challenge is the availability of water from wet to dry seasons. In order to be able to make use of more water than is available during the dry season – typically only some 10-20 per cent of the overall availability – water storage is a key measure. But this calls for the construction of dams and reservoirs; an option that is proving to be increasingly controversial. The massive World Bank-funded Sardar Sarovar dam project on the Narmada River in India is only one of the most recent examples.

It is urgent that a dialogue be opened between hydrologists, water resource engineers and ecologists in an effort to avoid the mistakes of one-sided solutions. In the long-term there is a growing conflict of interest between the human rights of local people who suffer from the construction of dams (and get little of the benefits) and the rights of neighbouring populations in poverty-stricken, drought-prone areas, to an increased share of the resource.

Urbanization introduces another dilemma. First of all, looking at the predicted population explosion in urban areas – especially the growth of megacities such as Mexico City, São Paulo, Bombay, Calcutta, and Cairo – it is hard to imagine how governments can possibly provide safe water and sanitation to such rapidly-growing numbers. The urban population in the developing world is expected to jump from 2 billion in 1990 to nearly 4 billion by 2025. Servicing such numbers will call for a doubling or even trebling of the efforts made by the International Water Supply and Sanitation Decade for the next three decades. The problem is the overwhelming impact on water supply of such huge 'point sources of demand'. As cities grow, more water has to be brought from further and further afield. In the end, water will be one of the main factors limiting urban growth in many water-short areas.

Urban populations also produce immense quantities of waste: human, industrial and municipal. Untreated human waste threatens the local groundwater supplies, since during wet seasons it will percolate through the soil and into groundwater aquifers. Industrial waste threatens both groundwater and rivers, making the water toxic and unfit for most uses.

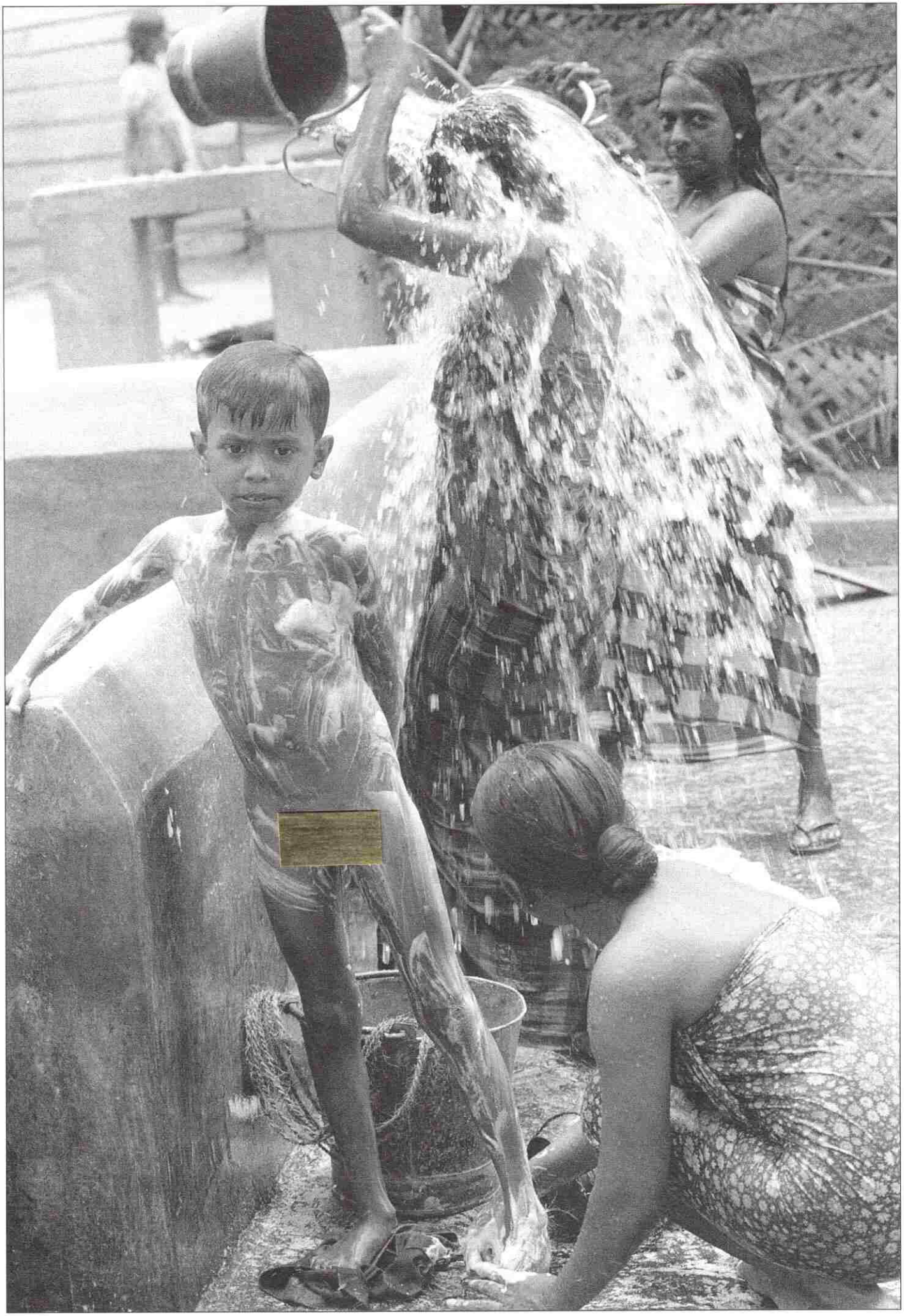
At present, urbanization is running out of proportion to the growth of the rest of the population. Some cities, like Nairobi, increased by over 600 per cent in one decade. With rural areas often starved for development, the city represents a chance for employment, as well as access to needed services. Those people forced off marginal lands hope to find a better life in the city; often they find only more misery. One way to limit the push from the hinterlands is to improve rural living conditions and concentrate on land rehabilitation and job creation.

As urban areas grow, water allocation problems are intensified. Where water is already scarce, urban areas tend to claim a larger share, cutting the amount available for irrigated cropland. This is already a serious problem in the Indian State of Tamil Nadu, where irrigation water from the Bhavani River system is being diverted to feed industrial expansion in the Coimbatore district. It may be more politically expedient to provide water to urban dwellers at the expense of rural needs. But the emerging question for politicians and resource managers is: where will the water be more useful – in the city, or drought-proofing agriculture to produce more food to feed ever-growing populations?

There is a clear need to take a completely new approach to water supply in a world that is facing increasing conflicts over its use (and misuse). The crucial questions in the dry tropics and sub-tropics – where most of the poorer countries are located – is how much water is actually available, moving through the landscape? How does reforestation and deforestation change that amount by influencing the flow of water that returns to the atmosphere? How do we get the maximum production out of the amount available in terms of both biomass and social and economic advancement?

The world is faced by the daunting prospect of an emerging water crisis in many areas of the developing world. How we answer these questions will have a tremendous impact on future management of critical resources. It will also have a tremendous impact – for better or worse – on the development prospects of many poor, water-short countries. ■

Malin Falkenmark is the world's first Professor of International Hydrology and a Global 500 Laureate. Her special interest is how the water cycle links environment and development, especially in the South.



MARK EDWARDS/IPPF

Securing water for the cities

Developing world cities, with rapidly growing populations, are facing serious shortages of fresh water. Even where half the population is not at present served with safe running water supplies, many cities face shortages. *David Satterthwaite* reports on the problem and how it can be tackled.

Many cities in Africa, Asia and Latin America have outgrown their capacity to provide adequate, sustainable water supplies. In Dakar, the capital of Senegal, for example, water supplies have to be drawn from ever more distant sources, including the Lac de Guiers, 200 km away. This is because local groundwater supplies are fully used, and polluted, and because local aquifers have been over-pumped, resulting in saltwater intrusion.

Mexico City has to supplement its ground-water supplies by bringing water from ever more distant river systems. Over-exploitation of underground water has also made the city sink – in some areas by up to 9 metres – with serious subsidence damage for many buildings and sewage and drainage pipes.

Hundreds of urban centres in relatively arid areas have also grown beyond the point where adequate water supplies can be drawn from local or even regional sources. Examples include many of the coastal cities in Peru (including Lima), La Rioja and Catamarca in Argentina and various cities in Northern Mexico. Many urban centres in Africa's dryland areas face particularly serious problems.

Other cities face problems in financing the expansion of supplies to keep up with demand: Bangkok and Jakarta are among the many major coastal cities with serious problems of subsidence from drawing too much from underground aquifers. In Jakarta, many shops, houses and offices can no longer drink the water from the wells they use because of saline intrusion.

Bathing at a communal well in Colombo, Sri Lanka.

In most countries, city-based demand for freshwater is only a small proportion of total demand, since agriculture remains the main user. But usually, the concentration of demand in a small area not only over-stretches local and regional sources but also pollutes rivers, lakes and coasts since virtually all water supplied to a city ends up as waste water or sewage (usually untreated) in local water bodies. A shortage of water adds greatly to the problem of disposing of wastes – especially liquid wastes from industries and sewage, which can be diluted and rendered much less dangerous when large volumes of water are available.

Inadequate management of waste water often poses as serious a threat to inhabitants' health as inadequacies in supply. Most urban centres in Africa and Asia have no sewerage system; most human excrement (and many other wastes) end up, untreated, in rivers, streams, canals and ditches. For cities with sewers, these generally serve only the richer residential, government and commercial areas.

Most urban centres lack the drains to handle stormwater and external floodwater so serious floods become common (usually seasonal) occurrences. Standing water often provides a breeding ground for insect vectors of diseases such as malaria. It is also common for low income settlements to have developed on flood-plains since most cities are close to rivers, lakes or the sea, and land which is regularly flooded is usually the only land poorer groups can obtain for housing.

For most cities, the problems centre less on a lack of water and more on poor management. For instance, freshwater shortages can often be solved through reducing leaks in existing piped distribution systems. This is usually much cheaper and easier than expanding water supplies; many cities' water supply systems lose 50-60 per cent of their water to leaks in the pipes. Reducing the leakage rate from 60 percent to 12 per cent (the typical figure for systems in Britain or the United States) would more than double the amount of water available for use.

For large industrial or commercial water users, there are a large range of techniques and technologies which reduce the volume of water they need with the additional capital cost being rapidly repaid – either to the water company because no new investment is needed in expanding water supply or to the consumer through lower water bills or to both. Many commercial, industrial and recreational water uses can be served by waste water from urban sewers or drains, with some minimal treatment within the city area. This is being tried both in Madras and in Mexico City.

The approach needed is one which analyses local problems and assesses which combination of actions will make the best use of local resources. For instance, where capital to extend piped water systems is lacking, a government programme to make water vendors more efficient and their water of better quality might be the most cost-effective option. In others, making use of local water sources for small independent networks for particular city areas may be more cost effective than extending the water mains.

The real constraint is that city and municipal governments remain weak, ineffective and largely unaccountable to citizens – and problems of poor water management become magnified even more when a city's population is growing rapidly. This constraint is linked to the reluctance of central governments to relinquish power to local authorities so they have the revenue raising powers and technical competence to meet their responsibilities for water supply and management. Inadequate water supply and waste management may be environmental problems but their resolution usually demands political solutions. ■

David Satterthwaite is Director of the Human Settlements Programme of the International Institute for Environment and Development. This article draws on the book Environmental Problems in Third World Cities *which he co-authored with Jorge E. Hardoy and Diana Mitlin, Earthscan Publications, 1993.*

Lessons from Jerusalem

Some claim the major issue confronting Jerusalem today is religious conflict; others claim it is water. Indeed, the struggle to ensure a steady flow of water for Jerusalem dates back as far as its history of religious strife.
Zia Daniell **reports on a modern conservation success story.**

Three thousand years ago, King David succeeded in conquering Jerusalem, ousting the Canaanites and seizing the city's only water source, the Gihon spring. Control of this spring has since been essential to the control of the entire city. Today, however, the Gihon spring is unable to fulfil all the water needs of Jerusalem's growing population; it can only provide a small amount of water to a community of Arabs living in the nearby neighbourhood of Silwan.

Jerusalem owes its water problems to its unfortunate geographic location, as the city lies at the edge of the Judaean desert, far from the nearest body of water. Limited external sources supply virtually every drop of its municipal water. At the present time, three pipelines pump water into Jerusalem from dwindling coastal and mountain aquifers; a fourth pipeline is still under construction. With its population of 550,000 increasing at 2 per cent per year, Jerusalem's water problems would appear certain only to multiply with time.

Yet according to authorities, Jerusalem's water use has actually declined in the past few years. The total amount of water used in 1991 was lower than the figure for 1983, despite a population increase of over 25 per cent. What prompted this big decrease in water consumption?

"The real key to reducing water use was conservation," says Aron Rosenberg, Deputy Manager of Engineering at Jerusalem's Department of Water. "Virtually all of our savings came about through various conservation programmes." In 1987, the Middle East was confronted with severe drought. Israel faced a national crisis as the Sea of Galilee, one of the nation's main sources of water, fell to threatening levels. Municipal authorities in Jerusalem scrambled to devise a

plan to help lower water use in the city. First, engineers physically improved the water system by checking and repairing system blow-out valves, replacing float valves in city reservoirs, and reducing water pressure in areas exceeding 60 metres pressure. Secondly, the Department of Water recommended that traditional flush toilets, which used a hefty 9 litres of water per flush, should be modified to allow for two options: a 9-litre flush or a 4.5-litre flush. The Department began to distribute flyers explaining how to adjust household toilets to the new system. The Department of Education helped ensure that all schools were checked and all toilets replaced with the new dual system. In addition, the Municipality placed advertisements in newspapers and buses, and helped issue a postage stamp encouraging general water conservation.

The Department of Water also clamped down on the major water offenders in the city. Authorities warned a group of industries and businesses using a disproportionate 23 per cent of all municipal water that they would be carefully monitored in the future, and that the Department would require a far greater emphasis on water conservation. As a result of these combined conservation policies, overall water consumption in Jerusalem dropped 8-10 per cent in 1987.

National policies, too, helped reduce water use in Jerusalem. A short-lived but effective law proscribed the use of a hose or sprinkler for irrigation during daytime hours. Night-time irrigation cut down substantially on the amount of evaporation, reducing the amount of water needed to irrigate successfully. Authorities slapped a high price on water used for private gardening, forcing the consumer to pay a price well above the actual cost of the water. Many switched from grass lawns to gardens filled with less thirsty local vegetation.

City parks also joined the ranks of more effectively irrigated areas. The City Gardening Department phased out its sprinklers, replacing them with computerized drip irrigational systems. The Department installed automatic meters in municipal parks, ensuring that only the required amount of water would trickle out of the pipes. Irrigational water use in Jerusalem promptly dropped 20 per cent from a total of 1 million cubic metres per year.

The end of the 1987 drought brought relief to Jerusalem, yet conservation policies have continued. While policy makers repealed certain laws, such as the banning of daytime irrigation, additional legislation has been submitted. Today, for instance, a pending law would authorize only those automatic car washes which use water recycling systems.

Jerusalem's current water policy also includes a number of established mechanisms which encourage the conservation of water. First, all domestic water use is scaled and every home fitted with a water meter. Customers pay 1.77 NIS ($0.65) for the first 18 m^3 of water used every two months, fol-

The old city of Jerusalem seen from the city wall.

JEREMY HAMAND

lowed by 2.61 NIS ($0.97) for the next 16 m^3, and finally 4.09 NIS ($1.51) for all water used beyond 35 m^3. In addition, a surcharge for sewage is added. Accordingly to Rosenberg, water within the first category is subsidized, within the second range is offered roughly at cost, and within the third range is sold above actual costs.

Another water expert, Gershon Baskin of the Israel/Palestine Centre for Research and Information, attributes part of Jerusalem's success to the newness and efficiency of the city's pumping system. "If you look at a city like London," he says, "between 40 and 60 per cent of the municipal water is lost as a result of leaks in the system. In Jerusalem, the figure is far less because we possess a newer system."

Rosenberg estimates that only 10 per cent of all water in Jerusalem is lost, yet he asserts that pipes in the municipality are not only newer, they are most frequently replaced. The average age of the pumping system is just 13 years. And not only are leaks in major municipal pipelines a concern; the Department of Water offers a domestic leak repair service 24 hours a day.

The Department of Water has also taken part in different programmes to reduce domestic water use. In an effort similar to the 1987 campaign to limit the amount of water used in toilet flushing, the Department is now embarking on a project to reduce overall domestic water consumption. The Municipality is working with an individual contractor to distribute water saving kits to households throughout Jerusalem. The kits, which include detailed instructions and devices to conserve water flowing from showerheads, kitchen taps and toilets, will be subsidized by the Municipality and offered to residents at a cost of less than $4. According to the information contained in the kit, consumers can reduce their domestic water use by up to 25 per cent.

The current campaign began in November 1992 when the Municipality placed advertisements in newspapers in Hebrew, Arabic, English and Russian. Flyers were then distributed to each household explaining how much water could be saved by using such devices. Two weeks before distributing the kits, project representatives left messages in each mailbox outlining the date and time when they would come to sell the kits. The representatives then had the task of visiting every home in the city of Jerusalem.

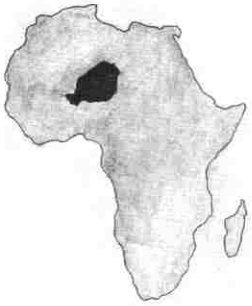
Rosenberg estimates that about 20 per cent of Jerusalem's households currently employ such conservation devices, and he hopes that another 40 per cent will choose to buy the kits during the current campaign. The campaign will also include a follow-up study to determine how many families actually install the devices, and how much water is saved.

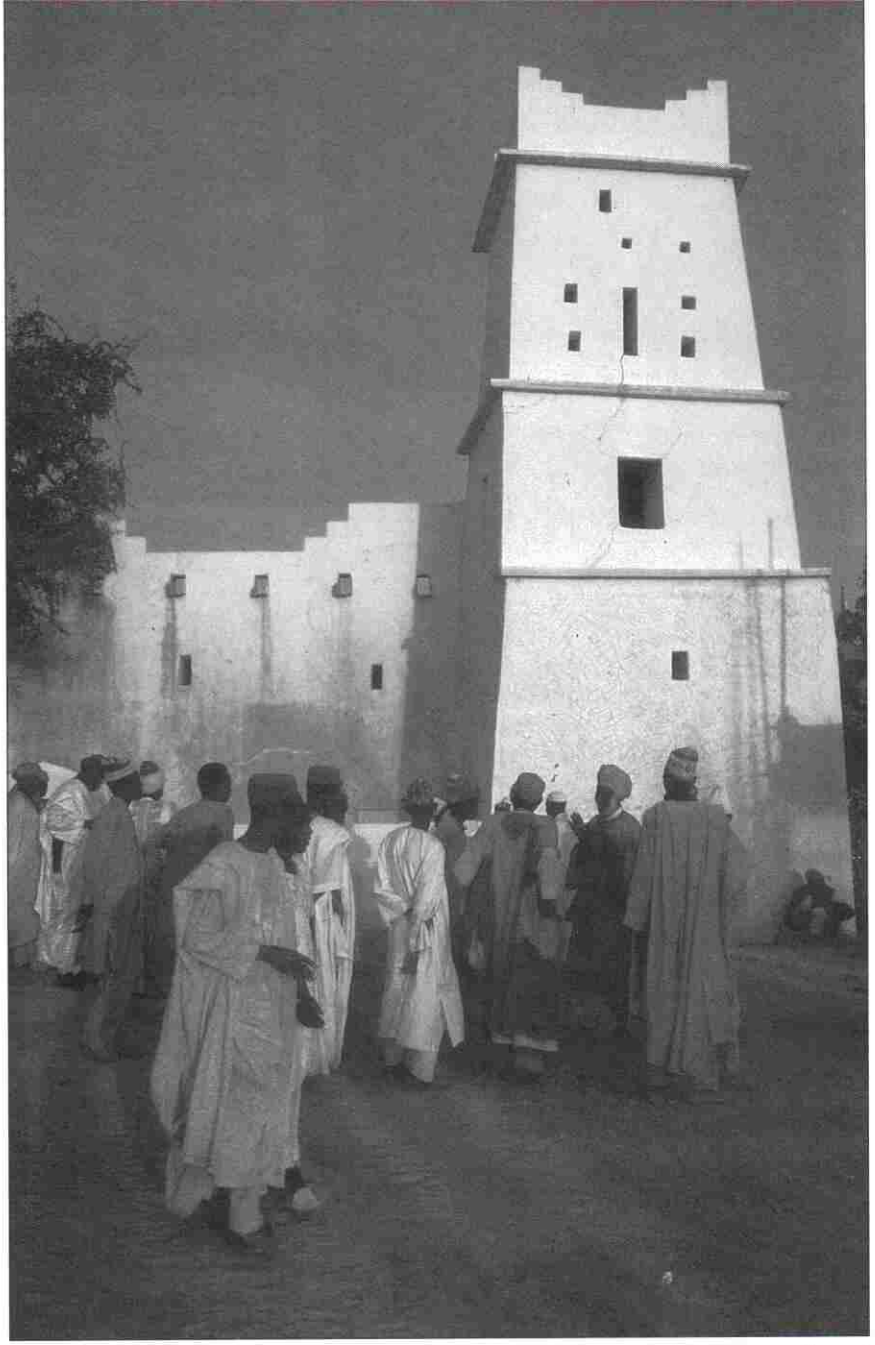
Jerusalem thus presents a picture of what can be done to conserve water in a region renowned for its arid climate and ongoing water shortages. Certainly Jerusalem is not exempt from the environmental problems plaguing most major urban areas; lack of wastewater treatment facilities, industrial pollution and imminent water shortages all threaten the city's current water supply. Yet in terms of water conservation, Jerusalem has explored some creative options which could be used effectively in a number of other cities. Perhaps this holy city could serve as a model for water conservation, not just for Muslims, Jews and Christians, but for people of all religions around the world. ■

Zia Daniell was, until recently, a researcher at the Hebrew University in Jerusalem.

Zinder: a city running dry

Thomas Price writes from Niamey, Niger.





NICOLAS THIBAUT/EXPLORER

Zinder is an old Hausa city in Niger, situated in the West African Sahel. Continuous, significant population growth over the last few decades has confronted increasingly acute problems in water supply. The impact of a drying regional climate seriously compromises the future of the city.

For centuries, Zinder played a prominent, prosperous role in the trade between northern and sub-Saharan Africa and it served as the colonial capital of Niger from 1911 to 1926. But the social and political importance of the city has considerably declined since independence. Other Nigerian cities have grown into administrative and commercial centres. Lower average rainfall and the devastating droughts of the 1970s and 1980s have severely affected the region's economic base.

The city has always had a problem with water supply. Zinder was built on an elevated, rocky hill, which had great advantages for defence as a fortified town protected by a wall. The hill is surrounded by dry river valleys with no major permanent bodies of water nearby. Wells dug within the city using local technology quickly confront impenetrable layers of stone in the earth. The year-round water supply has therefore depended on wells in the adjacent valleys.

Rainfall, however, has drastically declined in the last three decades. Average annual rainfall between 1930 and 1960 was 535 mm, falling to 355 mm in the 1980s. If groundwater is not adequately replenished, the impact on city water supply is immediate and dramatic. In a recent example, the availability of water from the national utility service for average daily consumption dropped from 6,500 m^3 to 3,500 m^3 during 1992 due to poor rains in the previous wet season. Given the difficulties of finding and furnishing water, the service covers between 80 per cent and 90 per cent of local needs.

The effects of water scarcity are particularly acute given the rapid increase in the population of Zinder. The city has grown steadily from 19,300 inhabitants in 1960, to 53,900 in 1977, and to 119,800 in 1988. The overall, current rate of population growth is 3.3 per cent in Niger, with clear trends for even greater increases in the urban areas.

Comparing population growth and water availability in Zinder shows just how precarious the situation is. Per capita water consumption in Zinder averages 55 litres per day, well below the average national figure of around 100 litres in the major urban centres. A quick calculation reveals that the average figure during the critical period in 1992 was about 29 litres of water daily, *excluding* commercial or other forms of heavy use. According to general, minimal standards set for urban areas of 20 litres per person daily for private use, Zinder has already reached – and probably surpassed – the point for guaranteed water supply.

In fact, the shortage is even more severe, since 20 villages surrounding the city depend on the same system for water. Some of these villages have as many as 5,000 residents. Zinder is also a refuge for the regional rural population during both the annual dry season and the drought years, which corre-

Left: *Ancient mosque at Zinder.*
Right: *Stella, with water reserve tanks in the school restaurant in Funza.*

spond to the periods of greatest water scarcity.

Plans to increase current supply run counter to these two inescapable obstacles: increasing urban population and lack of rainfall to replace needed groundwater. Considerable support promised by international financing organizations cannot resolve these challenges at a realistic cost. Under these conditions, what does the future promise for Zinder? ■

Thomas Price is IUCN Social Sciences Adviser in Niamey, Niger.

Flowers that threaten Funza

Sarita Kendall reports from Bogotá.

Funza is one of several towns on the rich agricultural plain west of Bogotá. Over the last 20 years the export flower industry has invaded the plain and the vast plantations, covered in plastic sheeting, have drawn thousands of people to Funza in search of work. A group of women meeting in one of the barrio schools talked about changes in the area and the deteriorating water situation.

"The water problem started to get serious about seven years ago," said Stella. "Before that the ditches along the roads ran with clean water and everything used to flood. Funza had water from San Patricio ever since colonial times – then suddenly there was hardly a drop and we were all fighting for water. People say it's the

SARITA KENDALL

flower companies that are responsible, that they have pipes taking the clean water and that their wells are sucking up all the water in the ground.

"The first flower company came here 22 years ago. There used to be potatoes, grains, beans growing here, but not any more. The women started working in the flower plantations. We didn't have any education and it was our first chance to earn money. It changed our lives, our living standards improved so much. We didn't think any further. Nobody realized that the flowers would use so much water.

"Sometimes there's been no water for weeks or months. The mayor organized a well with a pump, very deep down, but even that water started to fail soon. Then the municipality began to draw water from the lagoon – it used to be clean, it had fish in it. But now all the sewage goes in, and the irrigation water with pesticides and chemicals from the flower companies. Look..." Stella pointed to the water in the storage tanks in the school restaurant. It was a yellowy-brown with scum on top and thick sediment on the bottom. She boils all the water when cooking for the 150 primary school children.

"My daughter has terrible fungus all over her skin," said Gloria. "The doctor says it's the water. There are people with bad stomachs and fevers. The problem is, people here weren't used to boiling water and there's been no health campaign. It costs a lot, the gas for boiling."

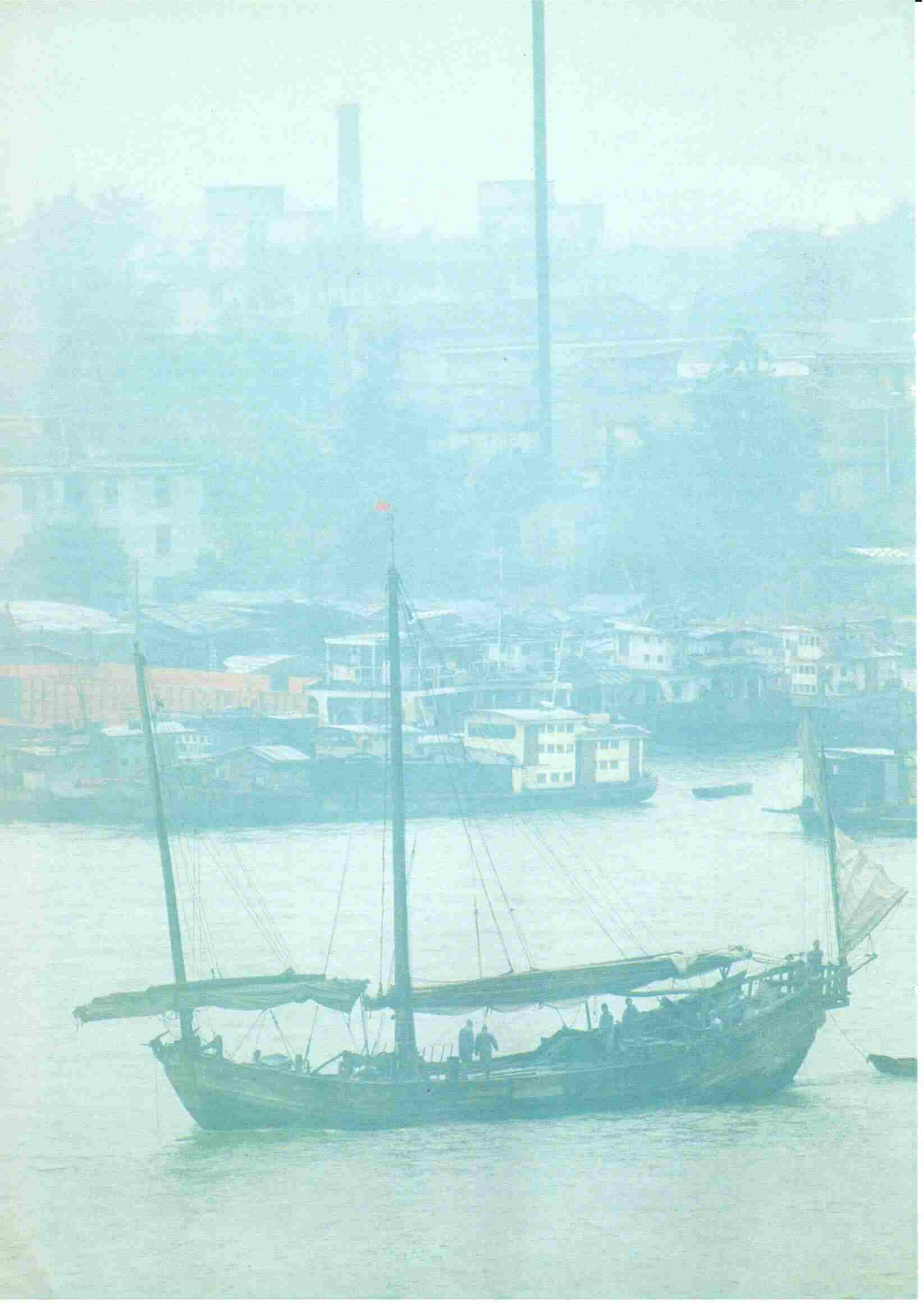
"There hasn't been water in the school taps for over a year and a half. They bring a tanker to the restaurant once a week," resumed Stella. "This barrio is lucky, we get water three times a week. But there's no pressure. When the water comes – it may be night-time – the women have to kneel for hours outside by the main valve, filling buckets. If you miss it, that's it. Some barrios get water once a week. People who have money bring barrels full in cars from Bogotá.

"Water is a woman's problem. The men don't notice, they expect their food to be ready and their clothes washed. The schools often close down for a few days – you can't have kids there with no water in the lavatories. What happens if the mother is working? The kids just go on the streets...

"The country is supposed to be rich in water. But no one looks after the rivers, everything's deforested. The school walls are cracking, one crack you can put your hand through." Other women chimed in that their houses had cracks too. "People say it's because there's no moisture left in the earth and it's just falling in."

"We have a committee for water rights, they went to see the mayor two days ago. He promised to instal valves for the barrios that never receive any water. And he said the project to bring piped water from Bogotá will be finished this year. But they've told us that for three years already. Anyway, it won't be enough because Funza has grown so much – they're going to mix it with the dirty lagoon water. People will be so happy if they have water in the taps that no one will protest any more."

The relief will be short term at best – the experts are forecasting that the whole of the Bogotá region may face regular water rationing in three to six years' time. ■



China's war on waste and pollution

On 16 February 1993, *The People's Daily*, China's leading national newspaper, carried two news stories highlighting the country's water dilemma.

The front page warned that the water level of the 6,300 km-long Yangtze, one of the three longest rivers in the world, dropped to 20 centimetres below sea level in mid-February at Shashi, in Central China's Hubei Province. It was the lowest water level for 20 years, and threatened to halt navigation on the upper reaches of the river.

The second story revealed that black-headed gulls, which have spent every winter for the past seven years in Kunming, capital of South-west China's Yunnan Province, departed for their annual migration a full three months ahead of schedule. They left abruptly because "they could no longer endure the deteriorating water environment" of Dianchi Lake, their habitat in Kunming, says Professor Wang Zijiang, an ornithologist with Yunnan University. "Fish and shrimps, the birds' principal food, are gone because of pollution."

The Chinese used to describe their water resources as "inexhaustible". No longer.

China has a total surface run-off of 2,700 billion m^3 a year, ranking fifth in the world after Brazil, Canada, the United States and Indonesia. "But actually China is a water-deficient country," says Qu Geping, director of the National Environmental Protection Agency. "Divided by its huge population of 1.17 billion, there accumulates in China each year only 2,500 m^3 of water to each person – which is barely equal to the amount actually consumed by each person annually in the United States."

This per capita water volume ranks China 88th in the world: only one-quarter of the world average.

China is further disadvantaged by an uneven distribution of water resources and rainfall. Surveys show that 62 per cent of China's farmland is located in areas where the annual surface run-off is less than 18 per cent of the total. Also, 85 per cent of the rainfall in North China and 70 per cent in the south falls in the summer, between June and September. As a result many dry areas have to prepare against floods every year.

According to Qu Geping, the ideal population size for China's limited water resources is no more than 650 million people. The country's huge population has long outstripped its water balance.

Even though China's per capita water consumption remains low – averaging only about 100 litres a day – the supply still cannot keep pace with growing demand. According to the Ministry of Construction, while China's urban water supply capacity grows 7 per cent annually, the demand goes up by 10 per cent. In 1992, 300 of the country's 479 cities suffered water shortages.

In the countryside, more than 20 million hectares of farmland and 93 million hectares of pastures are thirsting for water. It is a situation made worse by the pressure of people on existing and former wetlands. During

CHINA FEATURES

Once thought to be inexhaustible, China's water supplies are falling behind demand as industry and the cities grow and agriculture struggles to keep pace with a population heading towards 1.2 billion.
Xiong Lei **reports from Beijing on China's response to the problem.**

PETER CHARLESWORTH

Left: *The Pearl River at Canton.*
Top: *A polluted section of the Yangtze.*
Above: *Watering by hand in Guangdong province.*

PETER CHARLESWORTH

the past 40 years, much land was reclaimed from lakes in order to feed an ever-growing population. That cost China 35 billion m^3 of freshwater resources. From the early 1950s to the early 1980s, the total lake area shrank 11 per cent; more than 450 lakes vanished completely.

Furthermore, excessive exploitation

PETER CHARLESWORTH

of groundwater has resulted in land subsidence and falling groundwater levels in many Chinese cities. In Xi'an, capital of Shaanxi Province, the groundwater table has dropped more than 80 metres in the past 40 years. "Some 80 per cent of the groundwater resources in North China have been exploited," says Wang Weizhong, an official overseeing resource management with the State Science and Technology Commission. "It no longer pays to develop the remaining ones." He adds that the water problem "has become a major restriction on the development of China's economy."

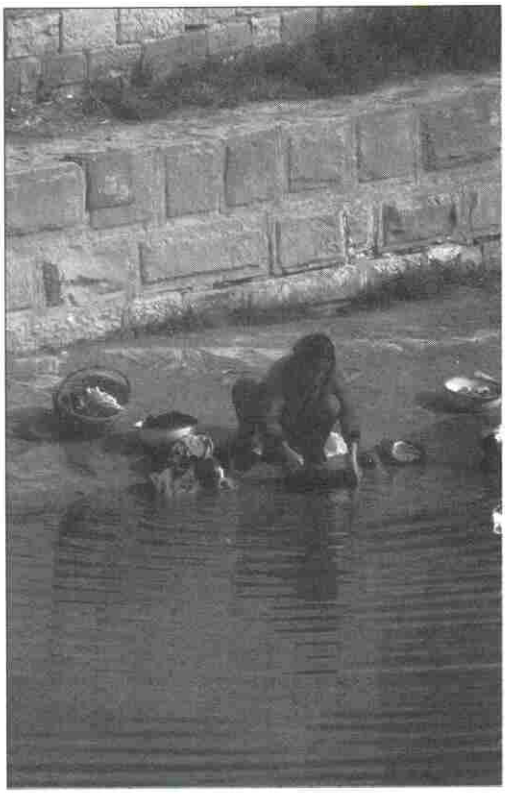
Several large-scale water diversion projects aimed at relieving the thirsts of northern cities like Tianjin, Dalian, Qinhuangdao, Qingdao and Xi'an were built in the 1980s. But Qu describes these as "ways when there was no way out." The water from these projects is very costly in terms of capital construction, says Zhang Linxiang, senior engineer and deputy director of the Department of Water Affairs Administration of the Ministry of Water Resources.

The project to divert water from the Yangtze River in South China to Beijing and other areas in the north will be built. But Qu Geping points out that the project, huge though it is, will still not provide universal coverage. While it is essential to promote family planning and slow population growth to alleviate mounting pressures on water resources, the process is "long and slow", he says. "A more urgent task is to extend resources by reducing waste and pollution."

Since the 1980s, the Chinese parliament has issued 11 laws and decrees on water, including a water law, laws for pollution prevention and control, and for water and soil conservation. Nationwide, more than 400 decrees and regulations dealing with protection of water resources and at the rational consumption of water have been issued by local governments.

In past winters the Ministry of Water Resources would receive about 60 urgent requests seeking emergency help to resolve water disputes between various provinces. "Thanks to the implementation of water laws and decrees, last winter we hardly received any messages like that," claims Zhang. "Meanwhile, losses due to mismanaged water projects have been reduced by 20 to 30 per cent annually."

Beijing's efforts to save water



As a centuries-old capital city, Beijing was once the scene of interweaving rivers and lakes. It was dotted with wells in the Ming Dynasty (1368-1644), and boats shuttled in the canal between the capital and Hangzhou, 1,000 km away in south- east China.

Although urbanization and population growth devoured most of the rivers and wells, Beijing managed to live on its seemingly abundant groundwater resources and never knew a water crisis until the 1980s.

"The worse water famine came in the summer of 1981," recalls Duan Wenjie, chief planner of the Beijing Waterworks Company. "The groundwater level had been dropping one or two metres a year, and there wasn't enough rainfall or other surface runoff to replenish it."

Between 1949 and 1992, Beijing's daily per capita water consumption went up from 28 litres to about 200 litres. Meanwhile, the annual investment in water supply jumped from 125,000 yuan (US$41,700) to more than 200 million yuan (US$35.1 million). But the demand seems to have grown faster.

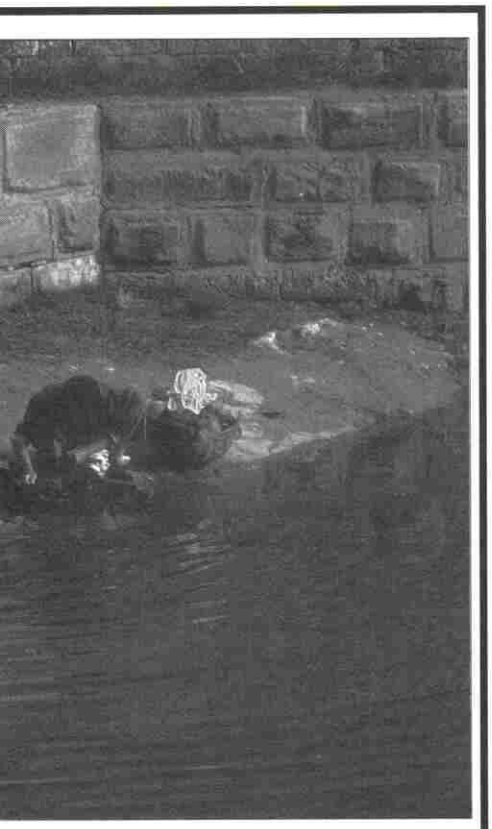
From the 1981 water famine the local leaders became more aware of the necessity to reduce consumption while extending sources. Wang Mingming, deputy director of the Beijing Municipal Water- Saving Office, says, "We have worked hard to make it known to the public that it is a virtue to treasure water resources and use it economically."

While the city had two more waterworks in 1985 and 1988, decrees and regulations on water saving were issued by the Municipal People's Congress and government, stipulating that all industrial enterprises should recycle their used water, and every household must have a water meter installed.

The decrees and regulations also forced all new projects to have water saving facilities designed, installed and operated simultaneously with the project. An overall plan gives an annual quota for water consumption to each hotel, factory, shop, government office and other work unit.

The city now has more than 200 licensed water inspectors to oversee the implementation of the regulations, Wang says. Those found guilty of wasting water are penalized.

"We also promote water-saving facilities and techniques," says Wang



Mingming. These include nine- and 11-litre tanks for flushing toilets, replacing the old 17-litre ones, water-saving tap washers, air-cooling facilities and computer-controlled car-washing equipment. Municipal government figures show that 82 per cent of water for industrial use was recycled up to 1992, against 46 per cent in 1981.

Duan Wenjie says the waterworks company appreciates what the water-saving office has done. "In one year after its establishment, consumption reduced by 24 million m³. The down-curve was maintained for a few more years and now annual consumption decreases by 10 million m³." ■

Xiong Lei

As people become more conscious of the need to save water, more advanced techniques are introduced. In the past eight years, water-saving irrigation techniques, such as sprinkling and drip irrigation, have been applied to 2.33 million hectares of farmland in North China, improving efficiency by 50 per cent.

But this is only a tiny fraction of the 35 million hectares of irrigated farmland, which consumes about 400 billion m^3 of water a year. Due to seepage and other defects, more than half the water is lost. For every kilogramme of wheat, 40 per cent more water is used in China than in advanced countries.

The industrial sector also promises great potential savings in water use. China's industry consumes 26 billion m^3 of water annually, of which only 45 per cent is recycled. "Our water consumption is unreasonably high compared with more developed countries," says Chai Wenzhong, an engineer with the Ministry of Construction. "For every ton of steel we use 20 m^3 more of water, and for every ton of paper, we use 200 m^3 more."

"By recycling another 15 per cent of water in industrial use, 5.25 billion m^3 can be saved annually," adds Chai.

Zhang Linxiang points to Beijing's outstanding example. "In the past 10 years the city's industrial output value more than tripled, but its industries' water consumption did not go up. That is encouraging."

Much water can also be saved by pollution control, insists Qu Geping, "but it is more difficult". Every year some 60 billion m^3 of industrial wastes and urban sewage are discharged throughout the country. Although 63 per cent of the 30 billion m^3 of industrial waste water is treated before discharge, the disposal is carried out in a scattered way at individual factories rather than concentrated efficiently at central treatment plants.

And even where some treatment has taken place, the disposed wastes still pose a serious pollution threat. "Almost every city is surrounded by a polluted river," observes Zhang Linxiang. "While the surface water in urban areas has been severely contaminated, the groundwater in a number of cities is also polluted to varying degrees."

Qu Geping thinks a total investment of 100 billion yuan (US $17.54 billion) would be needed to build two-stage treatment facilities for all the waste water. "That is far beyond the state's financial means," he adds. But if the percentage of treated sewage is raised from less than 10 per cent at present to 20 per cent, some 3.5 billion m^3 of water could be recycled for use by Chinese cities every year.

At present only 40 out of nearly 500 cities have two-stage sewage treatment plants in operation. But more and more cities are seeing the economic benefits of doing so and are building their own treatment plants.

Below left: *Chef with his ducks in the central Chinese city of Chengdu.*
Below right: *New industries are heavy water users: circuit board factory in Shenzhen.*

While emphasizing the need for two-stage sewage treatment in urban areas, Qu thinks it is more important to reduce industrial wastes by updating technology. "Most industrial enterprises are still using equipment and technology of the 1950s and 1960s, which produce too much waste," insists Qu. "This cannot go on."

TREVOR PAGE/PANOS PICTURES

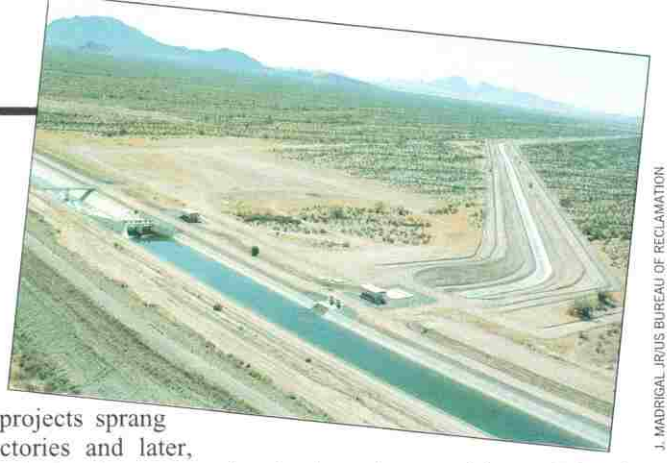
PETER CHARLESWORTH

Although China's water situation is grim, it is not hopeless. "People of some developed areas in South China are increasingly conscious of their environment and have the economic strength to ensure co-ordinated social and ecological development," concludes Qu.

Experts foresee that by the year 2000 about half of China's increased water supply will have to come from various water conservation measures. "While money remains a problem, we can try to alleviate the water stresses by promoting new technologies," says Wang Weizhong. "We also look forward to more international exchanges in this field." ■

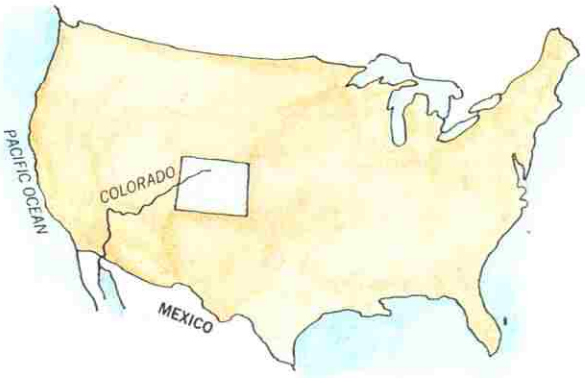
Xiong Lei is a journalist working for China Features in Beijing.

Fighting for water in the West



J. MADRIGAL JR/US BUREAU OF RECLAMATION

The American West has the most highly developed water supply infrastructure in the world, with more and better engineered dams, reservoirs, canals, pipelines and water treatment plants than have perhaps ever been built in history. But, like all desert civilizations that have bloomed and withered before, the West lives in constant fear of running out of water.
Steve Hinchman **reports from Colorado.**



A land of stunning beauty, encompassing over a million square miles and boundless natural wealth, the West is also mostly desert.

Settlers in the early 19th century found the region harsh and uninhabitable. Rainfall averaged anywhere from zero to 20 inches a year, and the few rivers were mostly wild, raging torrents, often cut deep into inaccessible canyons. The pioneers that stayed quickly convinced the US Congress that the only way to settle, or 'reclaim' this arid region was to dam the rivers and move the water to where it was needed.

In the century since, the Bureau of Reclamation and the US Army Corps of Engineers have radically transformed the landscape – bottling up once wild rivers in massive dams and reservoirs, diverting vast amounts of water from one river basin to another, creating millions of kilowatt hours of cheap electricity, and even making Lewiston, Idaho, 400 miles from the coast, an ocean port. Alongside these great federal water projects sprang up cities, farms, factories and later, tourism and recreation industries.

Fuelled by this giant public works programme, the West has grown faster than any other place in the United States. In 1900 it held 4 million people, or 5 per cent of a nation of 75 million people. By the 1990 census, the West had 50 million residents, or 20 per cent of the nation's 250 million people; plus the most populous state in the union (California, population 30 million); and the country's fastest growing city, Las Vegas, Nevada.

Today, most of the region's population, its industries, its farmlands, indeed its very existence, depends on the artificial manipulation of water in thousands of dams and tens of thousands of canals and pipelines.

But increasingly it is a precarious existence, as the West struggles with overdrafting of aquifers; erosion and desertification; loss of wetlands, riparian habitat and wildlife; water pollution; crop failures; and worst of all, drought and water shortages.

The problems have surfaced earliest and most clearly in the environment, where there are growing signs of widespread ecological collapse. Over the course of the last century, water developers have dammed, channelized or dewatered virtually every stream and river west of the 100th meridian with devastating impact. Today, the mighty Colorado, which carved the Grand Canyon and drains a fifth of the West, no longer reaches the sea. Every drop of water is used by urban or agricultural water projects. Along the way, intensive development has also claimed most of the river's marshes and wetlands, eroded its banks and pushed five native fish species to the brink of extinction.

In fact, all of the West's major river basins have at least one and in some cases half a dozen native species in danger of annihilation and which are formally protected by the federal government. Overall, fish are the most endangered class of animals in the West.

The ecological problems are also encroaching on human landscapes. Each year thousands of acres of prime farmland are lost to rising salt levels that crystalize on the soil and kill or stunt plant growth. The San Joaquin Valley of California, often called the richest farmland in the world, loses about 1,000 acres a year to salt saturation. That number is expected to rise exponentially.

At the same time, irrigation of more marginal lands washes millions of tons of salt into the region's river systems. The Colorado River, for example, picks up over 9 million tons of salt a year from human activities. Bureau of Reclamation officials estimate that those salts cause $300 million a year in damages by harming agriculture, corroding plumbing, and eating through hot water heaters and car radiators. By the end of the century, the US government will spend $1 billion – or $100 per ton of salt – to reduce salt levels in the Colorado basin alone.

Recently federal officials have discovered that many of the West's water projects may actually be poisoning surrounding areas. At California's Kesterson National Wildlife Refuge in 1985, tens of thousands of migratory waterfowl died from unexplained diseases, poisoning and birth defects. Officials at the refuge – which serves as a drain for the Bureau of Reclamation's Central Valley water project – later traced the problem to irrigation runoff that was carrying toxic selenium, arsenic and other naturally occurring metals from the fields into the marshes.

Four years later disaster also hit the Stillwater National Wildlife Refuge in Nevada, where selenium from another Bureau of Reclamation irrigation project caused an epidemic of avian cholera and gruesome birth deformities that killed hundreds of thousands of birds. In the wake of these devastating and highly embarrassing events, Bureau of Reclamation officials are investigating selenium poisoning at 43

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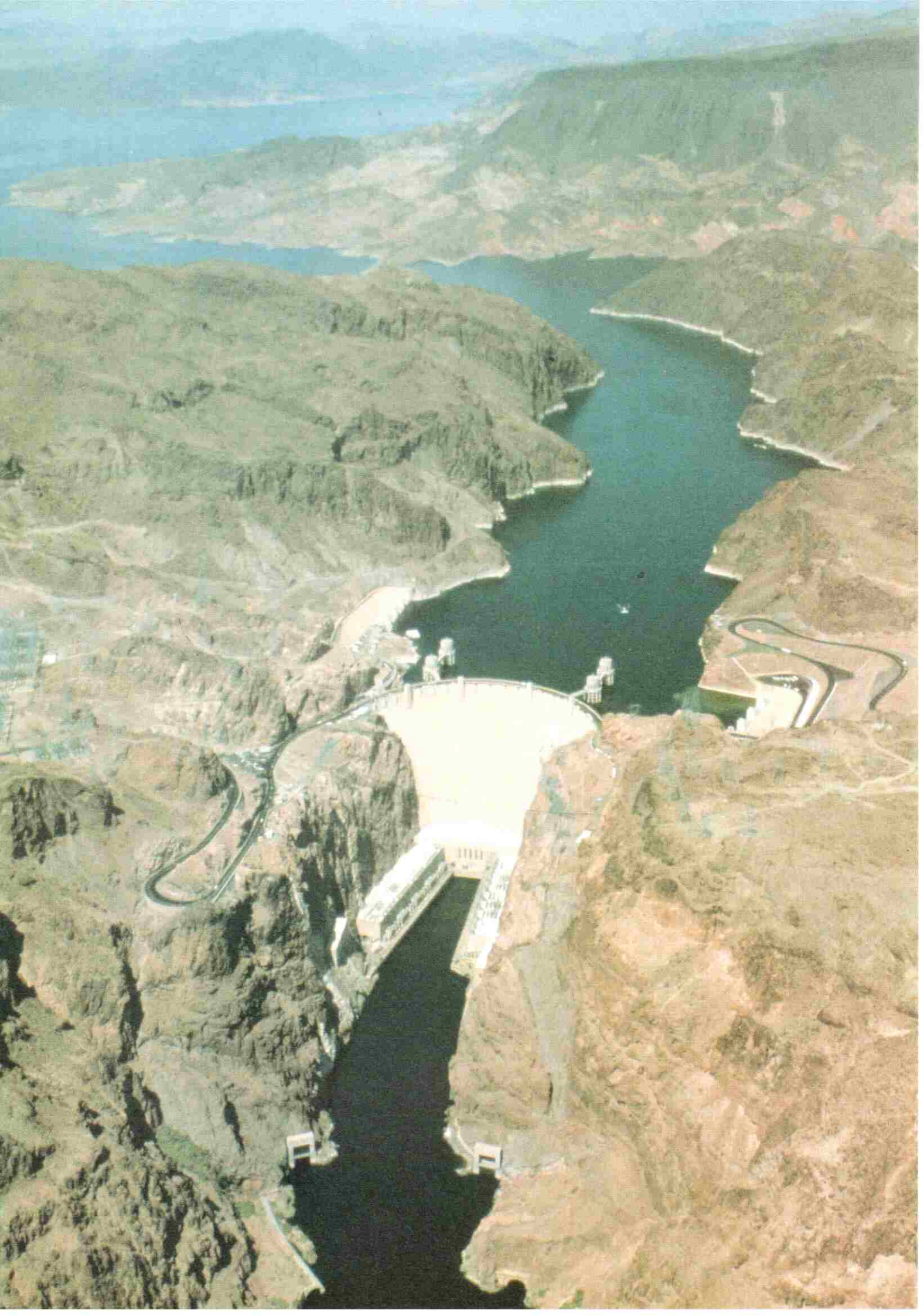
Above: *Irrigation canal on the Hayden-Rhodes River.*
Right: *Hoover Dam and Lake Mead.*

E. HERTZOG/US BUREAU OF RECLAMATION



refuges and water projects in 15 Western states.

Against this backdrop of an ever widening web of pollution and environmental problems, the West is also coming face to face with its limits. There is not enough water to sustain the region's current pace of development.

Perhaps the starkest example of looming water shortages is on the Great Plains. Farmers there produce 15 per cent of the nation's wheat and grain crops, using groundwater for irrigation. The source of the water is the Ogallala aquifer, an underground sea which stretches from South Dakota to Texas and has about as much water as Lake Huron. But farming there is more like mining: irrigation pumps lower aquifer levels by four to six feet per year, while nature puts back half an inch. At current pumping rates, experts predict that at best the farming economy on the high plains will last only two more decades.

Meanwhile, in California a six-year drought has forced strict water rationing in Los Angeles and San Diego. Despite record rainfall this year, it is still illegal in Los Angeles to water your lawn at midday, or even hose down your sidewalk or driveway. Unless a customer asks for a glass of water in a restaurant, it is illegal to serve it.

Las Vegas, which was growing by 6,000 people a month at the beginning of this decade, predicts it will need massive amounts of new water within 13 years. While developers build giant outdoor water fountains with every new casino, the city government is dreaming up billion dollar schemes to import water from Colorado, siphon groundwater from wells in central Nevada, or even pump desalted ocean water from California.

As these examples indicate, the region faces some difficult choices. Environmental problems and the skyrocketing costs of building new water projects have put a stop to dam building. In the last 10 years the Bureau of Reclamation and the Army Corps of Engineers have not started a new water project, and most of those under construction have either been dropped or scaled back. But at the same time, the flow of new immigrants – many of whom came here for the natural splendour and want the landscape preserved – has increased. Thus, the West must either learn to use less water, redistribute its existing supplies, or discourage further population growth.

The first move has been to conserve, albeit sometimes reluctantly. The city of Denver, Colorado, for instance, recently lost a fight to build a giant $1 billion dam that would have provided enough water to last well into the next century. While it searches about for other options, the city has begun extensive conservation efforts, installing water meters, making residents use efficient toilets and showerheads, replacing water-intensive lawns with artificial grass, and instituting tiered billing systems to discourage excessive water use.

Across the region other cities are doing the same, while farmers are lining irrigation ditches to reduce seepage and installing new water efficient irrigation systems. Conservation alone, however, will not be enough. And most Western states, desperate for economic growth, scorn even the thought of limits on growth.

At the same time, competition for scarce water supplies have made effective statewide or regional water planning politically impossible. What planning there is is done in the courts, as cities, farmers, Indian tribes, the US Forest Service, and environmental groups fight over water rights.

As a result, the price of water has risen sharply in the last decade, triggering water raids that pit wealthy urban areas against struggling farming communities. Thus it seems clear that the price of continued growth will be the erosion of the West's rural culture.

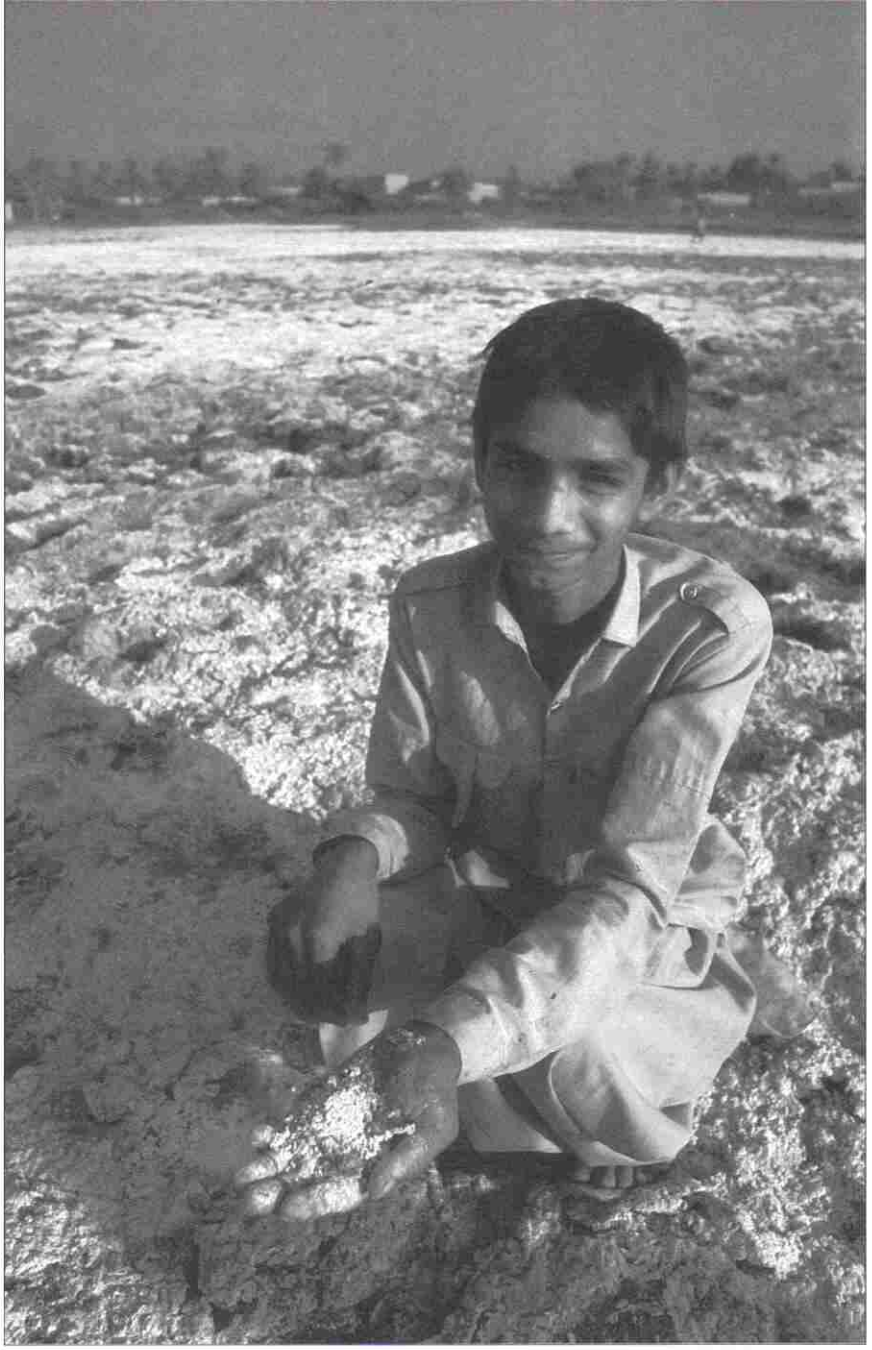
The transfer of water from farms to cities will sustain the region for a great while, and even solve some of its environmental problems such as salt loading. but, more difficult environmental problems will remain or worsen, such as endangered fish, loss of wetlands and riparian habitat, erosion of river banks, and water pollution, to name a few. These are the West's true limiting factors. ■

Pakistan on collision course

In the coming decades, Pakistan's rapidly growing population, almost entirely dependent on irrigation for food and fibre, is set to collide head-on with the limits imposed by a finite water resource, already used close to capacity. The looming crisis can only be averted by marked improvements in water use efficiency. But, says *Syed Ayub Qutub*, these will be difficult to implement, given the folly that has characterized government policies.

Pakistan, the eighth most populous country in the world, has the highest rate of population increase among 140 countries with more than one million people. It covers only 0.67 per cent of the world's land, contains 2 per cent of the world's people, but in the next 10 years will account for 4 per cent of world population growth. Much of this densely populated land is arid or semi-arid. It relies on irrigation from the River Indus and its tributaries for more than 90 per cent of its food and fibre production. The sustainable use of water resources is critical to its future.

There is an absolute limit to the amount of water available in the Indus Basin; the mean value is 137.2 million acre-feet (MAF). Once in five years



Boy with salinated soil, near Sukkur, southern Pakistan.

JIM HOLMES

the flows are less than 123 MAF. Approximately 104 MAF are already diverted at canal heads. Only 30 per cent of diverted water reaches the crop roots. The rest is lost to evaporation and seepage in canals and watercourses or during application in the field.

Groundwater is a secondary resource, derived from surface water percolation. Of the annual recharge of groundwater, estimated at 46 MAF, more than 41 MAF are drawn up by tube-wells and used, and most of the unused recharge is in areas of saline groundwater.

The first 25 per cent of water losses are in the canals. Nothing much can be done about them. Lining 40,000 miles of canals in the largest contiguous irrigation system in the world is a project beyond the capacities of the richest countries. A more pertinent enquiry would be why farmers, careful about most resource uses, are callous about water losses in watercourses and in field application? Some would argue it is a rational response to physical and price signals. The price of irrigation water has been kept low. Only half the operations and maintenance costs are recovered, and none of the capital and environmental costs; it has not made sense to conserve.

Water-withdrawals increased from 60 MAF to 104 MAF in the last three decades, thanks to projects under the Indus Basin Treaty, supported by massive funding from the World Bank and other donors. Nobody bothered to tell farmers such an increase can never happen again. Backed by international loans, government itself persists in the folly of expansion. There is now a plan to abstract 114 MAF, extending irrigation to marginal lands. Undoubtedly, coastal mangroves already under stress from reduced fresh water inflows will be decimated.

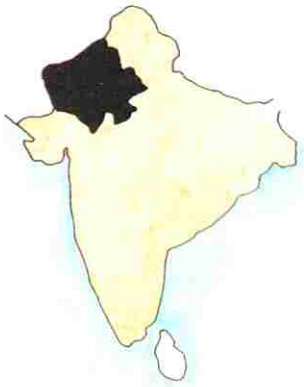
Also not taken into account are emerging competing demands from industry and municipalities. In addition to an estimated demand of 5 MAF by 2010 for non-irrigation purposes, liquid municipal and industrial effluent has affected the quality of surface and ground water. Until the recent completion of a National Conservation Strategy, the government organized by sectors and departments, had not even assembled the databases to address these multi-sectoral issues.

Watercourses are classic common property, shared by 20 to 100 farmers. Illiterate farmers have little skills for surveying and grading, and do not have the capital for precision land levelling, sprinkler or drip irrigation. Not being quantitatively minded, they are not even fully aware of the volume of water losses. Environmental costs of seeping watercourses, in the shape of waterlogging and salinity, are largely externalized to farmers downstream. These are the constraints to organizing improved common watercourse management. Government's policy for on-farm water management focused on one-time assistance in lining, and the lack of follow-up maintenance further reduces the initiative of local communities.

In these awkward, partly self-inflicted, circumstances, Pakistan must face a sudden inelastic limit on a critical resource. What will happen; will society collapse? I know of nine-year-old farm lads in jail for murder over water disputes. Is there another more hopeful view of the future? PIEDAR, the NGO I work for, and others like it are investing in building up farmers' communities for collective management of watercourses, training them in water measurement, surveying, land levelling and watercourse grading, using appropriate tools and techniques.

Organizing farmer communities is the only sustainable route to water use efficiency, but the work is painfully slow and small scale. It needs to be extended if the land and people are to survive. ■

Syed Ayub Qutub was co-ordinator of Pakistan's National Conservation Strategy and is a member of the People & the Planet *editorial advisory board.*



Defeating 'the worm' in Rajasthan

The SWACH project in the Indian State of Rajasthan is an ambitious attempt to bring sanitation, water and community health to a poor arid region. It has, over the years, attracted support from major aid agencies working with the state government. *People & the Planet* **correspondent,** *Bishakha Datta*, **and photographer** *Kai Friese*, **sent this revealing report on the project's strengths and its weaknesses.**

Shankar Jiva prances about in the mad March sun and shies away from questions. At six, Shankar is too young to realize he has created local history this year: he is the first person to come down with guinea worm disease in his cluster of Rajasthani villages. "Answer their questions," urges his father, Jiva, a blacksmith with a magnificent moustache. "Don't be shy." Shankar edges closer to him and offers a toothy grin.

"We were sitting around one evening," says Jiva, filling the silence. "Then we noticed these crooked lines running below Shankar's chest...like threads. Nobody else had it, so we wondered. Is this a vein or a guinea worm?"

Jiva and his family have lived in Parsaat, a village in Rajasthan's Udaipur district, for the last 15 years. This district, like many arid areas in Rajasthan, is home to the guinea worm – the long white worm whose larva is drunk into the body with water. While the resulting disease – which typically occurs at the onset of the agricultural season – does not kill, it does disable tribals and villagers who usually contract it. Villagers can't work in their farms. Patients lose up to six weeks until the worm calcifies and drops off.

Jiva walks us to the well from where the larva could have entered Shankar's body. The well is near their house; steep steps spiral down to its bottom, allowing the family to bathe, drink, and wash clothes inside the well. These stepwells play a significant role in transmitting guinea worm disease since they provide a common source for drinking and washing.

"It's simple," explains Dr B.L. Sharma, a doctor who extracts guinea-worms from his patients' bodies using ayurvedic techniques. "An infected person steps into the water to soothe the itching. If he has an open blister, the female worm can eject her larva into the water through that. If even one patient infects a stepwell, there may be many guinea worm cases next year."

Sharma is part of the guinea worm control team of SWACH, a government project that currently runs in four

Far left: *Shankar Jiva, guinea worm victim. Extraction scar can be seen on his abdomen.*
Left: *A dispersed settlement at Raida.*
Below left: *Women handpump mechanics at Tidi.*
Below: *Waiting at the handpump, Raida.*

districts of Rajasthan. SWACH – which means 'clean' in Hindi – aims for an integrated approach to Sanitation, Water, and Community Health, the very issues that give it its name.

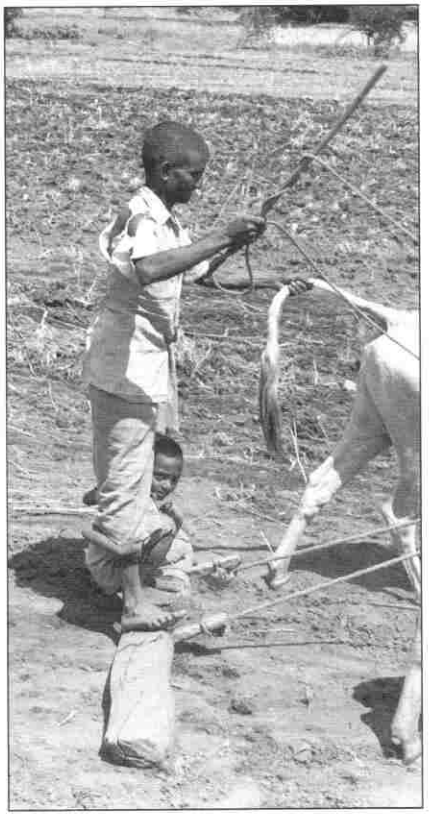
Guinea worm control is a priority for the project which is funded by UNICEF, SIDA and other development agencies. "The traditional water sources have been responsible for this disease," says project director J.D. Mohanty. "We have to break the contact with the water source." Mohanty is the sixth government officer to head SWACH in seven years; his predecessors' names are enshrined on a plaque in his office.

Mohanty outlines how the project tries to break the guinea worm cycle: by converting step wells to draw wells inside which people cannot step; by providing hand pumps as alternate sources of potable water; by teaching people to filter water before drinking it; by using locally-developed ayurvedic techniques to extract the guineaworm from the patient's body before it breaks through the skin. "When a cured patient returns to the village, he becomes very cost-effective," says Mohanty. He gives the other villagers incentive to report the disease."

It is important to extract the guineaworm before it reaches the skin – and turns infective. Much of the credit for developing safe, aseptic techniques for guinea worm extraction go the doctors like B.L. Sharma, who are trained in ayurvedic medicine. Allopathy has largely ignored the guinea worm; village doctors have either sucked it out through pipes or rolled it out on matchsticks. Neither of these methods is considered safe enough, but a prestigious medical team from Delhi recommended that Sharma's ayurvedic method be used in primary health centres. The technique has now been exported to Africa.

Back in his office, Sharma unscrews a transparent jar and proudly plucks out what looks like twine from a pool of formaldehyde. This is the guinea worm that lay in Shankar's chest until Sharma coaxed it out through an incision. "I once took out 50 guinea worms from one person's body," announces Sharma, for whom guinea worm extraction has evolved from a weekend hobby to a professional obsession.

Such efforts underlie SWACH's remarkable record on guinea worm control. The number of cases reported in SWACH's area of work has dropped tenfold – from 8,000-odd cases in 1986, when SWACH started up, to about 800 last year. The results are equally striking at the village level: in Sarsiya village, the number of guinea worm cases has come down from 56 in 1990 to 20 in 1991. Last year, there wasn't a single guinea worm patient in this remote village. "We are close to eradication," says Sharma.



One aspect of the achievement has been the involvement of local women in handpump maintenance. In the village of Tidi we watch three women repair a handpump. Although the event has been staged for us – the women specially brought by jeep to this broken handpump – the spectacle is impressive. Three women in grey jackets worn over saris turn spanners and screws, wrestle with wrenches, hoist pipes, and replace the handpump's faulty washer. "It's usually the washer," says Raseela, the most articulate of the three.

Raseela and her two companions are among 70 women that SWACH has trained as handpump mechanics. "The earlier handpump mechanic used to come from far away, Raseela says. "So the handpump used to remain spoilt." She realizes that since "women only collect water," it is in the women's interests to learn how to repair handpumps – traditionally considered a male task.

The women – who underwent a three-month training programme – have now been given handpump repair contracts by the Panchayat Samitis or village governments. This has also brought them fame. "Even if they don't know my name, they know I am the handpump mechanic" adds Raseela shyly.

Like other mechanics, Raseela has a zone of ten-odd villages to attend to. "At first, the villages wouldn't call us because we were women." But now, she cycles to each village when called, a red toolbox in tow. "Villagers don't know how to use handpumps," she says, explaining that handpumps frequently get spoilt. "They pump with too much force." Does she teach them how to pump? Not really, she shakes her head.

That, unfortunately, points to a weakness in the project. Mechanics who keep repairing handpumps but don't consider it important to show villagers how to pump reflect a lack of a broader approach to health education. On paper, SWACH is a project with an integrated approach to sanitation, water and community health. In practice, it has largely remained a guinea worm control programme.

The main contribution that SWACH has made in these broader areas is to provide the tangibles of water and sanitation: 40,000 funnel filters, 8,000 converted stepwells, and an equal number of handpumps and washing platforms. We see cows drinking water from neat troughs built near handpumps; at one handpump, a thirsty village boy drinks water through the funnel.

Far left: *Man and boy tilling at Badlai.*
Below: *Children draw water from a converted stepwell.*

While provision of these tangibles has brought safe water to about 1.5 million people, it has also created what one independent evaluation terms the 'hardware ethos'. In the process, says the study, "software aspects, as the project people like to refer to health education, have somehow acquired secondary importance."

Everywhere we go, we meet villagers who are experts on the guinea worm – but understand little else about safe water. At Palodra, a large village that serves as a hub for buses, we run into Laxmi Devi. Laxmi lives in Mau wada, a nearby village of a 100-odd houses where there are separate handpumps for lower castes, Muslims and other castes.

Laxmi, who works as an animator for SWACH, will talk nothing but guinea worms until pushed by persistent questions. "People get diarrhoea, dysentery, fever in my village," she says, comfortably sipping tea amid men at a highway stall. "Measles, then malaria, jaundice." Her attitude suggests that these are somehow less important than the worm – even though there hasn't been a case of guinea worm in her village for five years.

I ask Laxmi what causes the other diseases – many of them water- borne. She doesn't know. "We don't really talk about this," she says.

But Laxmi cannot be faulted for defining her role within narrow parameters. Back in the office, project director Mohanty readily concedes that the project has not paid adequate attention to other aspects of water, although he presumes that better-quality water means less water-borne disease. "But it is true," he shrugs. "We do not monitor other water-borne diseases."

If the link between water and health is sidelined, broader community health issues are equally remote. On paper, SWACH presents itself as an instance of "how a campaign to attack a specific disease can be used as an entry point for a fully-integrated village-level public health programme." But in practice, no one's talking public health.

Several project personnel clearly articulate their perception that SWACH is a guinea worm control programme – and should remain that way. Says one senior staffer, "For two years in between, we tried to turn it into a broader programme. But I feel that was wrong." And a project officer is vehement that "we should only have one focus otherwise nothing will get done".

The inability to shift focus from a single disease programme to a community health programme is transparent at the village level. We visit Badlai, a hamlet that forms part of the tribal village of Sarsiya. This remote village stretches over miles of scrub, since each hillock contains only one house. As the jeep heaves towards Badlai over rocks and stones, a crowd of villagers collects. They include Nanji and Bhagwat Singh, two young men with shaven heads who work as scouts for SWACH.

Bhagwat Singh, who has studied up to the 7th standard, explains what he does as a scout. "Twice a month, I go to people's houses and teach them how to filter water." Scouts like Singh are invaluable foot soldiers of the guinea worm surveillance team. They hear of cases at the village level, offer basic treatment like bandaging, and ensure these reach SWACH's medical centres in time to extract the worm.

Nanji, the other scout in Badlai, explains health practices in colourful word-pictures that often characterize tribal worlds.

A group of women cling to the shade; Nanji, acting as hesitant interpreter, explains that they often have premature babies. The local midwife uses unboiled blades to cut umbilical cords; she is astonished to hear that the simple act of boiling can prevent infection. "*Naaru wale* (the guinea worm people) never tell us all this," Nanji suddenly burst out. "They only ask us about guinea worms."

There are many intangibles which speak eloquently of the gap between project and people. Project officials do not ask villagers to sit while answering questions; villagers don't offer us tea – unthinkable on any visit to rural India.

This gap between project and people has been referred to in independent evaluations. While every study acknowledges SWACH's successes in certain areas, one asks the question: "Whose problem is guinea worm? Is it people's problem or project's problem?"

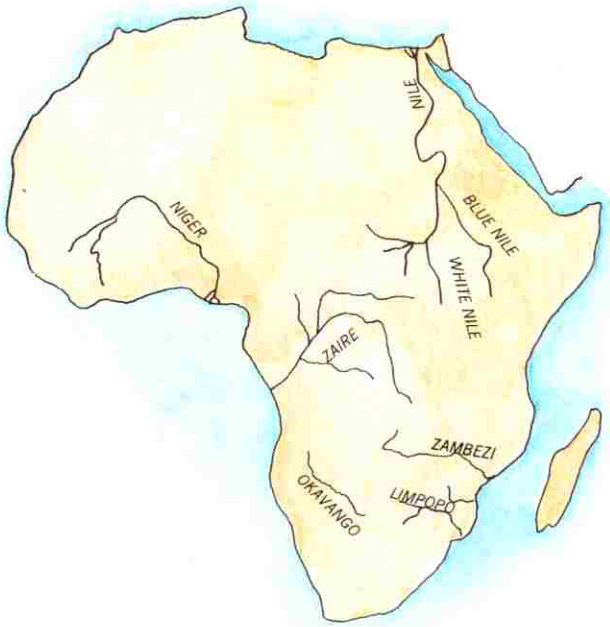
Everything crystallizes as we reach Kodi-Modi village, clattering over seven kilometres of stony dirt road. On the way we pass four men carrying an ill man on a rope bed.

The tribal village of Kodi-Modi is important since it produced the largest number of guinea worm patients from here; Vala Kanji is among them. Kanji's gold tooth gleams as he shows us the scar it left.

"You might get it again this year," I say. "Yes, I might," he says. We probe. "I don't know how it comes into the body," he keeps saying. "It just comes into the body." Kanji ignores the urgings of the local scout, and cues from SWACH officials. "I don't know how it comes."

It is the same story. Hardware over software. Tangibles over intangibles. Handpumps over health education.

It is a bitter irony to go back to the SWACH office and see a blue poster that reads "Water from the top has no effect until it reaches root level." ■



Managing the wetlands

During the last 50 years, major rivers such as the Limpopo in southern Africa, have been drying up. More recently, the flow of others, like the Zambezi in central Africa, appears to be decreasing. This could be the thin edge of a greater desiccation, warns *Patrick Dugan*, if efforts are not made to better manage the river basins and wetlands of the continent. Here he outlines the philosophy behind the IUCN's approach to Africa's freshwater problem.

Current patterns of freshwater use in Africa cannot be sustained if the continent's population continues to grow at its present rate. Between 1960 and 1990, the population doubled to 450 million. Unless there is a rapid reduction in family size, it will double again in 21 years. So that by 2010 it will have passed the billion.

To survive and develop, these billion people will need water. But Africa is a semi-arid continent, with erratic rainfall overlying a mosaic of fragile ecosystems. Its people are already feeling, most acutely, the shortage of freshwater. The situation is made more difficult by the continent's size, its poor communications and its large number of countries, not all of which live on good terms with their neighbours.

The people of Sub-Saharan Africa, in 46 countries, are also heavily dependent on agriculture. It supports 66 per cent of the population and provides essential exports. Its healthy development is a key to slowing rural-urban migration, which threatens to overwhelm the capacity of the cities to absorb the migrants. But productive agriculture, in turn, is totally dependent on a regular supply of freshwater.

That water is finite. It will never increase, and without due care it may decrease. Major rivers like the Limpopo in southern Africa, and the Save/Sabi which flows through Zimbabwe and Mozambique to the Indian Ocean have dried up and now flow only seasonally. There are indi-

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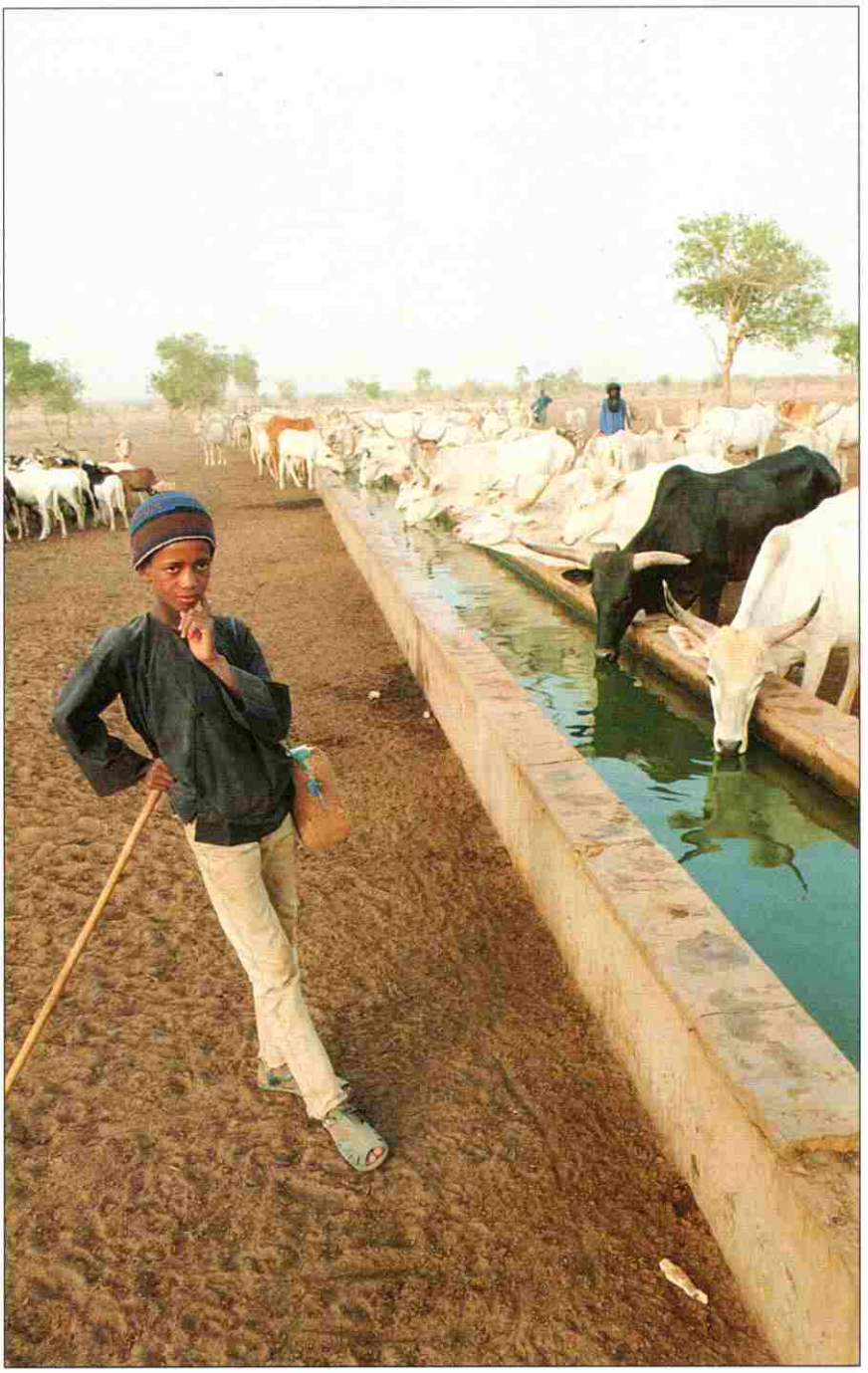
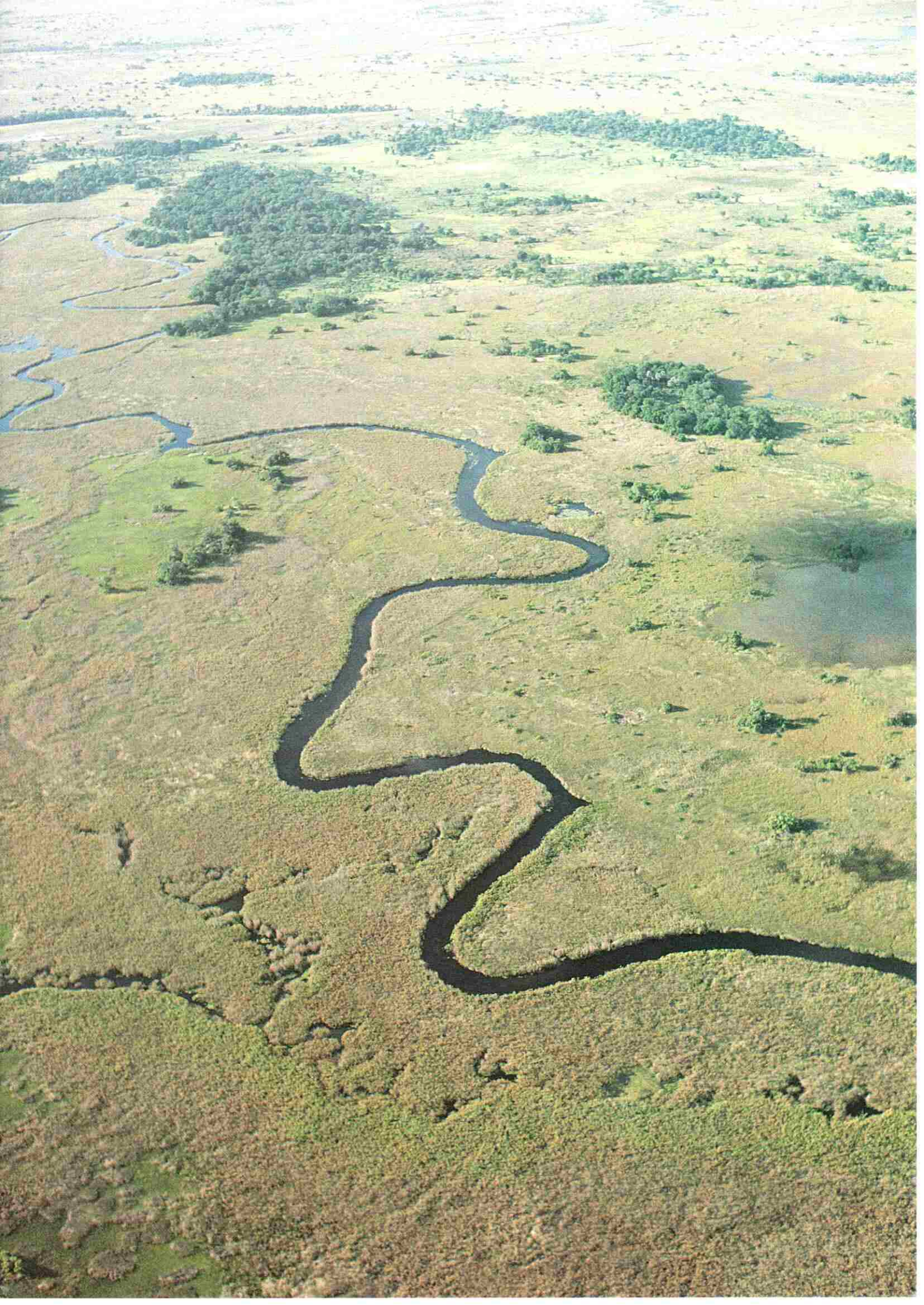
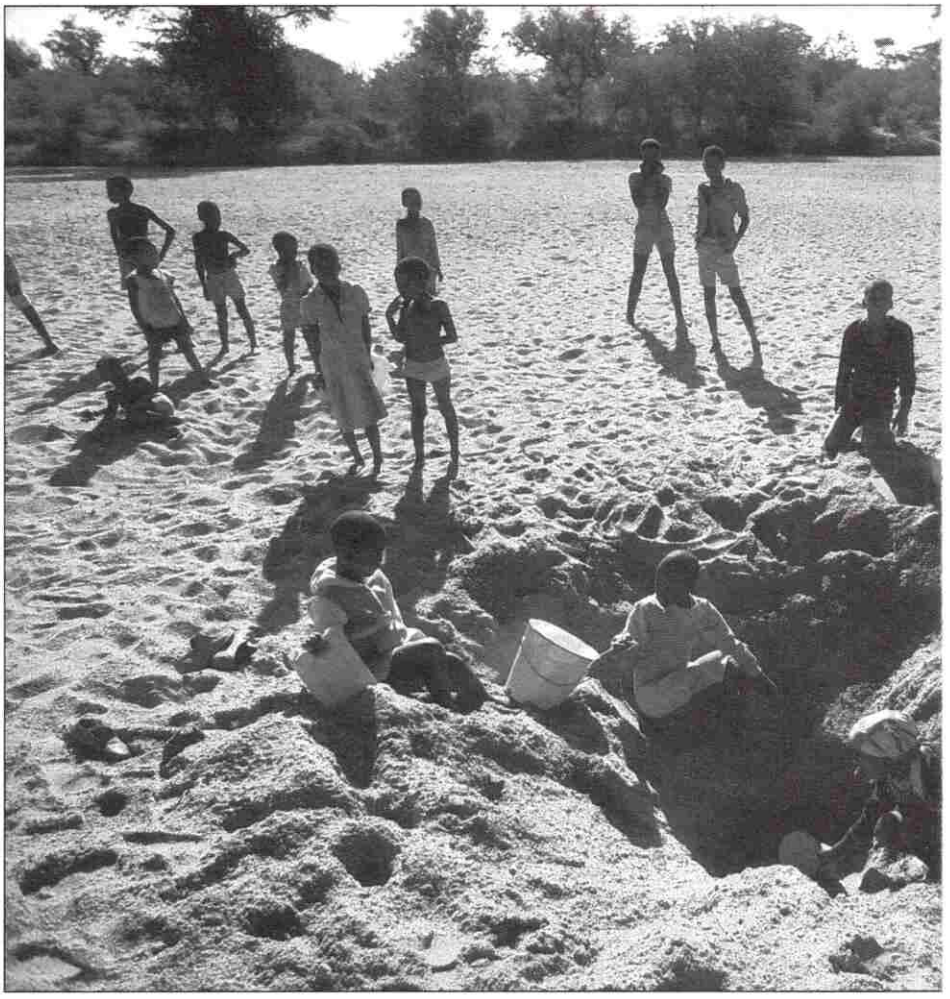


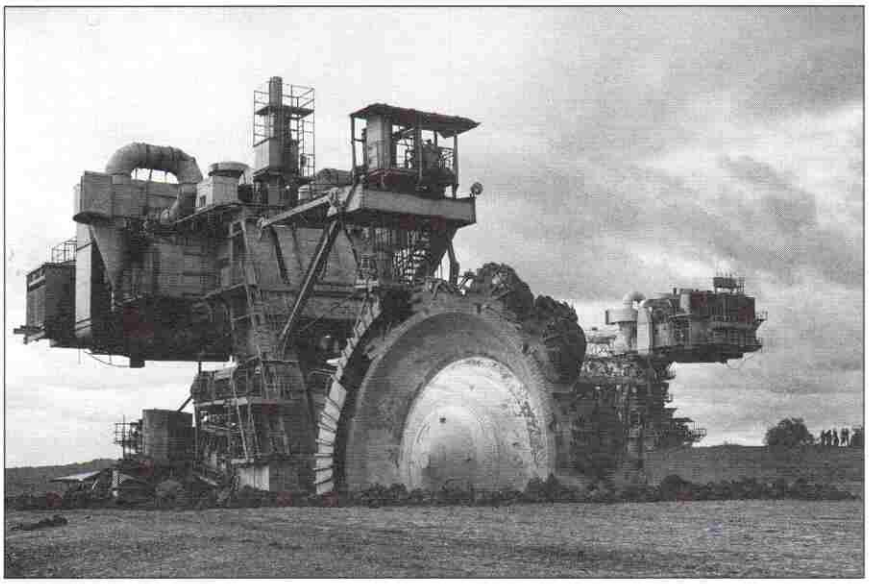
JEREMY HARTLEY/PANOS PICTURES

DAVID REED/PANOS PICTURES

Right: *Livestock drinking at a water trough in Senegal.*
Far right: *Okavango Delta wetlands in Botswana.*







WENDY WALLACE

cations that the flows of the Chari-Logona, the Nile and the Zambezi have also been decreasing. This could be the thin edge of a greater desiccation if Africa's river basins continue to be mismanaged and if current projections of global climate change are correct. Growing desiccation, in turn, would increase the pressure on the natural wetland ecosystems.

With the exception of the White Nile and the Zaire rivers, African rivers discharge seasonal floods every year, in complex and unpredictable patterns. The floodplains generally become larger as they move downstream to the deltas. On the Niger, for example, the flood peak moves slowly downstream taking over 100 days to travel some 1,760 kilometres. The Senegal floodplain in West Africa covers some 5,000 km^2 in flood, but shrinks to only a tenth of this size in the dry season.

Even in semi-arid regions like the Sahel, there are extensive wetlands, such as the inland delta of the River Niger in Mali, the Sudd wetlands of southern Sudan, or the Okavango Delta in the Kalahari Desert.

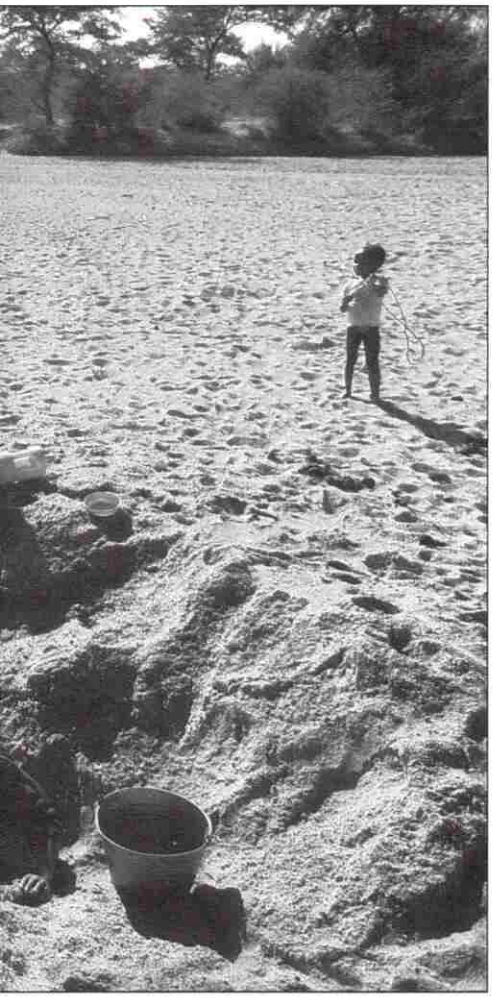
Nearly all such areas are home to large human communities, and nearly all have become the focus for 'development projects'. Some of these have attempted to enhance rural lives. More often they are designed to meet urban-industrial demands. They commonly involve large dams and hydro-electric projects built with little regard for the wishes or needs of the local inhabitants. As a result their success rate has not been encouraging.

The economic value of such wetlands is often overlooked. The Niger Inland Delta, for example, supports a population of 550,000 people, and in the dry season provides grazing for a million cattle and a million sheep and goats. Some 80,000 fishermen use the delta and it supports 17,000 hectares of rice cultivation, or half the total rice production in Mali.

In fact, wetlands have a strategic importance out of all proportion to their size. They replenish ground water and sustain dryland grazing systems, among many other functions. They provide a natural form of irrigation, to which local communities apply many carefully-developed techniques, cropping on both rising and falling floods.

Such natural irrigation can be very productive. About half a million people are supported by floodplain cropping along the Senegal floodplain which runs for 600 km downstream of Bakel, and is up to 30 km wide in places. Many local families also keep cattle and catch fish.

River basin planning, which impinges on such areas, has been applied both within countries – through schemes such as the Botswana National Water Development Plan – or in international drainage basins, such as the Senegal, Chad, Gambia and Niger basins. This is development planning on the grand scale and frequently involves foreign experts, on the assumption that the northern industrialized world 'knows best'. In practice many such schemes fail entirely to understand the wisdom of



Left: *Collecting water from dried up river bed in Botswana.*
Below: *Giant machine used to work on the Jonglei Canal, now suspended.*

BRUCE PATON/PANOS PICTURES

local management practices, and some are environmentally disastrous.

The 360-km Jonglei Canal, aimed at speeding waterflow through the Sudd swampland of southern Sudan, halted since 1980 by the civil war, has its defenders. But it would have had a damaging impact on the 400,000 pastoralists living in the area, as their lands dried up from the siphoning off of some 20 million m^3 of water per day for irrigation projects in Egypt and northern Sudan. This is not to mention the half million wild grazing animals, including some 300,000 large rare antelopes (Tiang), which depend on these wetlands.

River basin planning has been widely adopted in Africa, with examples ranging from the Volta River Authority – where the Akosombo Dam created the largest artificial lake in the world, displaced 84,000 people and covered what was formerly some of the most productive agricultural land in Ghana – to the Aswan High Dam in Egypt, the Tana and Athi River Basin Development in Kenya and the Niger Dams Authority in Nigeria. International projects include the huge Central African Power Corporation, concerned with the Kariba and Cahora Basa dams on the Zambezi.

Such projects are not only large and expensive. They are also frequently flawed. Nigeria, with the most extensive system of river basin planning in Africa, has exposed the worst excesses of stifling bureaucracy. As the Nigerian geographer, A T Salau, has written, "most of the new river basin authorities have not collected enough data to warrant the large-scale developments they envisage". There has been a lack of trained staff to appraise the work of foreign consultants. The result can be haphazard and risky development, very far from the ideal of controlled, efficient and integrated planning that is needed. "It has", says Salau "to some extent, foreclosed alternative ways of improving rural welfare and productivity."

There is an inescapable logic to the concept of integrated planning for sustainable development, which is the central theme guiding IUCN's Wetlands Programme. "It is not the principle of planning water resources in an integrated way that is at fault, but the grandiose scale of the plans that have been put forward in Africa," says William A Adams in his study *Wasting the Rain: Use and Misuse of Rivers and Wetlands in Africa*.

It is the lure of complete control over nature by a centralized technical planning body that has so often failed, says Adams. Understanding the interactions of human uses, and the ways in which they relate to the natural variations in river flow, is vital to any sustainable future in Africa, he adds.

Even now, dam design is dominated by hydrology, engineering, geology and economics. Disciplines like sociology, anthropology or development studies are rarely given a professional role to play, and if they are it is too often a token one.

Many of the dams built on African rivers have had serious, even disastrous environmental impacts. "It is truly tragic that the dams that Africans are enduring debt to build have such serious side-effects," says Adams. Such massive engineering projects affect the human use of the floodplain, through for example, grazing. They affect the breeding of fish and fishing economies, they upset the natural balance between the various resource users, creating a context for disputes.

Indeed, the idea that water resource development should involve the building of large dams and large-scale irrigation schemes is outmoded. It has been shown that the massive costs do not justify the modest, or even negative returns.

The dominant desire to control natural processes and to transform economic activity ignores the serious limits to our understanding of the African environment. Technical advisers, engineers and governments consistently fail to understand the resource-use systems they are affecting, and particularly, the way in which they are inter-linked. And the planning procedures which until now have been used, are frequently incapable of producing projects that use money effectively, improve the environment and raise the living standards of the rural poor.

There is another way. The IUCN Wetlands Programme has begun a series of initiatives in partnership with African governments which builds on the principles of the World Conservation Strategy, *Caring for the Earth*.

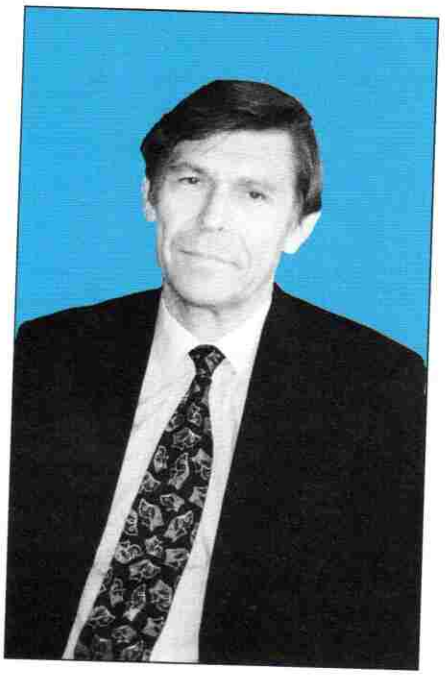
In Uganda, it has helped develop a National Wetlands Conservation and Management Programme. A similar effort is under way in Tanzania. In Nigeria, the Wetlands Programme is supporting the Hadejia-Nguru Wetlands Conservation Project. This is an attempt to promote integrated and sustainable use of the floodplains along the Hadejia and Jama'ara rivers against pressures of upstream water abstraction and demands for canalization downstream.

In all such cases. IUCN puts the focus on the way natural systems work, the way people adapt to them, and the strategies necessary to enhance the productivity of the resources in ways that maximize human benefit. ■

Dr Patrick Dugan was, until recently, Head of the IUCN Wetlands Programme, based in Gland, Switzerland. He is now Director of Regional Affairs at IUCN.

Population and water

Professor Genady Golubev is a world expert on water. One of the few Russians to hold a high position in the conservation field, he worked for many years with the United Nations Environment Programme. He is a Vice President of the International Association of Hydrological Sciences as well as Assistant Director-General of the World Conservation Union (IUCN).



JOHN ROWLEY

People & the Planet: **There is much criticism of big dam projects, but the reality is that something like 36 per cent of the global harvest comes from irrigated cropland. What is your own attitude to such projects?**

Golubev: It is not a 'yes' or 'no' question. If you do not build dams, you have to either increase the arable area of non-irrigated land or to intensify agricultural production on the presently used land. And intensive dry farming brings its own environmental problems, such as those related to the usage of chemicals. Of course, dams create many negative results, very large dams particularly so. The alternative is to find the right trade-off between the losses and gains associated with the dams. So you cannot just say 'stop it'.

The best example is the Aswan Dam. Everybody knows how bad the consequences of the dam are. It has disrupted the usual regime of irrigation during the annual flood and prevented the replenishment of natural fertilizer through the good silt the floods brought, among other things. But at the same time, when the dam turbines began to turn they provided nearly a quarter of Egypt's energy needs and increased considerably the irrigated areas to meet the growing demand for food.

This was crucial in the 1980s when for seven years there was very low water in the Nile. The government had to use all the water coming from upstream, but also had to release water from the Aswan reserve to keep up production on the irrigated land. Without that the seven lean years would have been lean indeed. The dam saved Egypt from catastrophe.

Nevertheless IUCN appears to be pretty critical of engineered solutions of this type?

Yes, because many engineers seem to believe they can achieve everything through engineered solutions, which they cannot.

Look at what happened to the Aral Sea in Central Asia as a result of faulty watershed management on a really large scale. The result is, I believe, the worst environmental disaster of our time. Something like 30 million people have been affected as a result of new irrigation schemes, all started with good intentions, of course. But the result has been that the sea has shrunk, the fisheries have been lost, with massive pollution from pesticides, enormous salinization, deteriorating water quality, and appalling damage to the health of the people.

So would you defend the Narmada River dam project in India?

I have to be very careful about saying anything about that, because I do not know enough details. I see the good intentions of the Government of India. At the same time I am worried about the fact that there are very many dams in the project. So I would like to see the whole thing reconsidered.

The real issue in all such cases is a moral one. Decisions have to be taken not just for this generation but for future generations. Should we be changing nature in ways which cannot be reversed when our grandchildren are alive? It is also a matter of what is sustainable. Some irrigation schemes, and the culture which goes with them, have lasted for millions of years. But where the natural drainage is poor, very special care is needed. Without that it is better not to do it at all.*

There are something like 26 really water-scarce countries, mostly with rapidly growing populations, and mainly in Africa and the Middle East. What is the solution there?

The answer is better use of existing water. There is always a trade off between increasing the amount of water available as much as possible without damaging the environment too severely while at the same time using the available water better. And there are some examples of water used in a really good way.

But you are right to mention growing populations. We are approaching some very difficult situations in the balance between water and people. I have estimated that by the year 2025 no less than 96 countries, with a population of 6.4 billion will face considerable water shortages. Of these, 45 countries, with a population of 1.4 billion will face very serious levels of water shortage.

So, on present population projections, there would be physical limits to further human development. And that would lead, inevitably, to strong conflicts between countries and social unrest within countries. In other words, it is absolutely vital to slow population growth or we shall be in for tough competition for water resources, leading to serious consequences.

Are you, therefore, confident that the world can supply enough water for 8–10 billion people?

No, because it won't help a farmer in Egypt that the Amazon River still carries a lot of water into the Atlantic Ocean. The downstream Nile will not provide enough water. And that will be the situation in many other countries. So in very many countries with growing populations there will be a water crisis ■

*In April, the Indian Government asked the World Bank to cancel its remaining loans of $170 million for the half-finished $3 billion Narmada River dam project, as it will not meet the tough environmental conditions laid down by the Bank. Nevertheless, India is expected to press ahead with the project.

Towards a water ethic

Why has so much of modern water management gone awry? And why is it that ever greater amounts of money and ever more sophisticated engineering have not solved the world's water problems? These are the questions asked, and answered, by *Sandra Postel* in a new Worldwatch book, *The Last Oasis*, from which this essay is extracted.

At least part of the answer to our water dilemma is that we are trying to meet insatiable demands by continuously expanding a supply that has limits, both ecological and economic. A host of nuts-and-bolts measures – from thrifty irrigation techniques and rainwater harvesting to water-saving plumbing fixtures and wastewater recycling – can help us out of this predicament.

Yet there is something missing from this prescription, something less tangible than drip irrigation lines and low-flow showerheads – but in the final analysis as important. For at the heart of the matter is modern society's disconnection from water's life-giving qualities. For many of us, water simply flows from a tap, and we think little about it beyond this immediate point of contact. We have lost a sense of respect for the wild river, for the complex workings of a wetland, for the intricate web of life that water supports. By and large, water has become strictly a resource to be dammed, diverted, and drained for human consumption.

We have been quick to assume rights to use water, but slow to recognize obligations to preserve and protect it. For sure, better pricing and more open markets will assign water a higher value in its economic functions, and breed healthy competition that weeds out wasteful uses. But we also need a set of guidelines that stops us from chipping away at natural systems until nothing is left of their life-sustaining functions. In short, we need a water ethic – a guide to right conduct in the face of complex decisions about natural systems we do not and cannot fully understand.

JIM HOLMES

Boats on a section of the Indus River, Pakistan, showing how shallow the river has become.

The essence of such an ethic is to make the protection of water ecosystems a central goal in all that we do. This may sound idealistic in light of the ever more crowded world of needs and aspirations in which we live. Yet it is no more radical than suggesting that a building be given a solid foundation before raising it 10 storeys high. Water is the basis of life, and our stewardship of it will determine not only the quality but the staying power of human societies.

Adopting such an ethic would represent an historic philosophical shift away from the strictly utilitarian, divide-and-conquer approach to water management and toward an integrated, holistic approach that views people and water as related parts of a greater whole. It would make us stop asking how we can further manipulate rivers, lakes and streams to meet our insatiable demands, and instead to ask how we can best satisfy human needs while accommodating the ecological requirements of healthy water systems.

Living by such an ethic would mean using less whenever we can, and sharing what we have. In practical terms, a water ethic is part of a sustainable development code that entails a wholly new approach to economic progress, one that harmonizes economic goals with ecological criteria. The single-minded pursuit of crop production, industrial growth and urban expansion has damaged numerous aquatic ecosystems that support fisheries, provide habitat for waterfowl and other wildlife, and protect water quality. Besides causing tangible monetary losses, this deterioration signals that systems essential to our own wellbeing are breaking down.

A society guided by a water ethic would have a set of indicators to

monitor these trends, and would make course corrections to restore ecosystems to health before irreparable harm is done. We may see glimmerings of such an ethic at work where scientists are trying to undo the damage caused by unsustainable economic development, as in south Florida's Everglades or Central Asia's Aral Sea basin. But these are attempts to bring ecosystems back from the brink of destruction. They are costly, and offer no guarantees of success. Were an ethic operating at the outset, different economic choices would have been made, and the degree of violence done to nature greatly lessened.

For a test case of ecologically guided development, we might watch Botswana's Okavango Delta. All the usual pressures and tensions to develop water for economic gain are there, threatening to ravage this unique wild place. But so far, the government has listened to local people who rely on the delta's abundance of fish and wildlife for their livelihood, and who want the wetland to remain intact.

Governments, the World Bank and other lending institutions that help set water priorities and directly fund many projects can help make this new ethic operational by placing ecological sustainability at the core of their investment policies and decisions. More often than not this will favour smaller-scale projects – such as pumps and wells for groundwater development, micro-catchments, or small reservoirs to collect and store local runoff – over large dams and river diversions that tend toward greater disruption of natural systems. Community-based projects are also better able to focus on meeting the needs of the poorest people and to engage local people in development efforts from the outset – prerequisites for sustainable economic progress.

In many cases, a water ethic would require a reordering of economic goals and priorities. As water becomes scarce, sustainable development depends on raising its productivity – getting more value out of each litre used – while leaving enough in rivers, lakes and aquifers to keep natural systems functioning well. This may mean, for instance, that boosting food self-sufficiency is not a wise or realistic goal for some countries.

Egypt, for example, will soon exceed its water budget, yet the government is attempting to reclaim an additional 60,000 hectares of desert each year in order to expand crop production. Given the projected growth in population and today's level of per capita water use, the nation's total water demand 20 years from now will exceed its allotted share of the Nile by nearly 60 per cent. Long before this point, ecosystem functions will be grossly impaired as stream flows diminish and water quality deteriorates.

The 'good neighbour' aspects of a water ethic come into play at all levels of human interaction – from personal behaviours and life-style choices to international relations and commitments. It remains a grave moral shortcoming that 1.2 billion people cannot drink water without risking disease or death. The reason is not so much a scarcity of water or inadequate technologies as a lack of social and political commitment to meeting the basic needs of the poor. It would take an estimated $36 billion more per year, equal to roughly 4 per cent of the world's military expenditures, to bring to all of humanity what most of us now take for granted – clean drinking water and a sanitary means of waste disposal.

Stronger notions of equity and fairness must also be interjected into international relations if tensions over water are to be defused. Like oil, water is a strategic resource for which nations will compete fiercely as it becomes more scarce. International law embodies an ethic of equity among nations within a watershed or river basin, and lays out basic notions of rights and responsibilities with regard to shared watercourses. But clearer criteria are needed by which to judge, for instance, what constitutes a reasonable level of per capita use given the total amount of water available in a river system, and what constitutes a fair apportioning of water among nations sharing common sources. In the meantime, it is up to neighbouring countries to work out mutually agreeable water-sharing terms and treaties.

For individuals, a water ethic calls for an examination of life-styles and consumption patterns with an eye toward reducing personal claims on the earth's finite water supply. As an essential ingredient in most manufacturing operations and the receptacle for much of our waste, water has a role in virtually every product we buy and is polluted by much that we throw away. We rarely think about water when we see an automobile, for example, but producing a typical US car requires more than 50 times its weight in water.

A kilogramme of steak produced by a typical California beef cattle operation, uses some 20,500 litres of water. As the world struggles to grow enough food for a larger population, the amount of water needed for feedlot-style meat production may preclude meat-rich diets.

Ultimately, securing sufficient water for people while leaving enough for a healthy environment overall depends on a rapid slowing of population growth. If current trends persist, per capita water supplies worldwide will drop by more than a third by 2025. Efforts to raise living standards for the additional 3.1 billion people alive then will place enormous strains on natural systems. Moreover, human numbers continue to grow fastest in some of the most water-short regions. At current growth rates, the populations of 18 of the 20 countries in Africa and the Middle East now qualifying as water-scarce will double within 30 years. No set of technological feats, however imaginative, can win such a race. Reducing birth rates through comprehensive family planning and equal economic opportunity for women – vital for so many other reasons – is essential to a secure water future. ■

Sandra Postel is Vice President of Research at the Worldwatch Institute.
The Last Oasis: Facing Water Scarcity *is published by W W Norton in the USA and by Earthscan in the UK.*

Making common cause

In this issue Gadfly reports on a profound problem that looks as if it can be turned into a splendid opportunity. For years the twin issues of population planning and family planning have, like many twins, often fought. The population planners – with their sticks and carrots of incentives and disincentives, their targets and one or two-child strictures – have been at odds with the family planning human righters, whose central concern is that parents should be enabled to have as many or as few children as they wish. Now, it seems, they can after all make common cause.

Those, like the Chinese, who felt that they could not possibly feed, house and employ the coming multi-millions, thought they had no alternative but to act vigorously to encourage smaller families. If they did not, a far harsher coercion would, ultimately, be imposed by nature. Singapore and other like-minded governments have adopted less stringent tax and other planning measures. Opponents of such a top-down approach have frequently taken the view that if only governments took care of the people, population would take care of itself. Their slogan was "Development is the best contraceptive".

Fortunately it now seems that individual interests may no longer be ranged against society's interests. According to some innovative analysis by Dr Steven Sinding, Director of Population Sciences at the Rockefeller Foundation, there is such a large amount of unwanted fertility and such an inadequate supply of family-planning facilities today that if all couples were enabled to have as few children as they prefer, this measure alone would go a long way to help population growth rates to approach what is "socially optimal". That is to say, if we were to meet the wishes of individual women through family planning on a purely voluntary basis, this would head toward much the same outcome as would struggling to attain population planning targets set by governments.

To be specific, the number of unwanted births is now reckoned to be a whopping one in four. Women at risk of pregnancy amounted in 1990 to 747 million, of whom 381 million (51 per cent) were using some form of contraception and 366 million were not. A very conservative estimate of women with unmet needs for family planning can now be taken to be at least 12 per cent (alternative estimates are as high as 15 and even 17 per cent). If their birth control needs were met – and to repeat, they should be met on sheer humanitarian grounds anyway – this would reduce the total fertility rate in developing countries from the present 3.8 to 2.8 children. In turn, this would take us well over half way from current fertility to replacement-level fertility. It would also reduce the ultimate global population by more than two billion people.

As an indication of what can be accomplished through vigorous measures, consider the case of Kenya, again using some recent analysis by Dr Sinding. In the late 1970s, only 17 per cent of women wanted to have no more children or to delay further pregnancies. The figure surged within just ten years to 49 per cent; and during the same period, the contraception prevalence rate jumped from 7 per cent to 27 per cent (it is probably 32 per cent today, and could well rise as high as 40 per cent by 1995). This remarkable breakthrough has largely been due to a massive effort to get girls into school. School enrolment climbed from a mere 19 per cent in 1960 to 71 per cent in 1985, leaving Kenya with one of the highest female literacy rates in all Africa. Among women with no education, contraceptive use is only 18 per cent, but among women with primary education it is 30 per cent, and with secondary education 40 per cent. The desired family size has now declined to 4.4 children; if contraceptive use indeed soars to 40 per cent by 1995, fertility could well slump from 6.7 children in 1990 to 4 children just four years later. If all Kenya's unmet demand were satisfied, contraceptive use would climb to 57 per cent.

All this is not to imply – the point is emphasized – that we should not continue to press ahead with efforts to relieve poverty (the poorest have the largest families), to achieve accelerated socio-economic advancement, and, above all, to enhance the status of women through greater opportunities for education, employment, and social standing all round. Apart from the imperatives of development, the result will be to generate motivation for still smaller families.

Nor does the analysis suggest the population explosion could be sputtering out. Even if all parents opted for a two-child family forthwith, we shall still be stuck with the prospect that in many countries, because of the youthful population profile (half the populace aged 15 or less, meaning lots of potential parents for the future), population growth will continue for another two generations and human numbers will double. And we need all the reduced growth we can get. According to a new assessment by Drs Henry Kendall of MIT and David Pimentel of Cornell University, our hopes of feeding the world's multitudes are strictly limited. A business-as-usual scenario proposes that in all the developing world except China, per-capita grain production in 2050 will be lower than today, while in Africa, where the population is projected to grow by 142 per cent, production will be 40 per cent lower than today's woefully inadequate level.

But the better news is that at last – at long splendid last – we can start to bid goodbye to the dreadful standoff between individual rights and social needs. Many people have rightly felt that government targets for population planning can lead to the heavy-handed tactics that often characterize a top-down strategy. Instead we can look forward to much more in the way of user-oriented and need-derived responses to population issues – with benefit for human wellbeing, the environment, and development all round. To cite James Grant, Director-General of UNICEF, "Family planning could bring more benefits to more people at less cost than any other single technology now available to the human race." ■

Associates' News

Indigenous peoples

The IUCN, with the co-operation of Indigenous Survival International (ISI), is establishing a task force on indigenous peoples and the sustainable use of natural resources.

There is a growing realization that many protected areas and areas of importance for biodiversity are managed by indigenous communities which live in, or are dependent on, these areas for their livelihood; and that these communities can make an important contribution to sustainable resource management systems.

The task force will focus on ways of involving indigenous communities in strategies for sustainability, and make policy recommendations about IUCN's role in implementing these strategies. These initiatives are a timely contribution to the 1993 Year of Indigenous People.

The work of this task force will be furthered by a Symposium of Indigenous People, to be held later this year in Hawaii. This will involve indigenous community leaders in formulating a published guide and recommendations for action.

■ *Contact the Social Policy Service at IUCN, CH- 1196 Gland, Switzerland.*

New lessons from Matlab

Few pilot programmes have been as extensively researched as the Matlab maternal and child health/family planning project in rural Bangladesh. While the rise of contraceptive prevalence during the early years of the project has been documented, relatively little is known of more recent trends and patterns.

Now the Population Council's *Studies in Family Planning* has reported on the results of a 1990 survey of knowledge, attitudes and practice of family planning in both the intervention and control areas.

The study by Michael A. Koenig and colleagues shows that contraceptive prevalence had reached 57 per cent in the intervention area and only 27 per cent in the control area, despite the fact that there are no significant differences in the socio-economic conditions or in the demand for family planning methods between respondents in the two areas. They concluded that the higher usage level is a result of the quality of the intensive client-oriented family planning programmes in the intervention area.

The authors believe that the Matlab experience proves that even under unfavourable conditions, family planning programmes can be successful if they are appropriately designed and implemented.

■ Studies in Family Planning, *November/December 1992.*

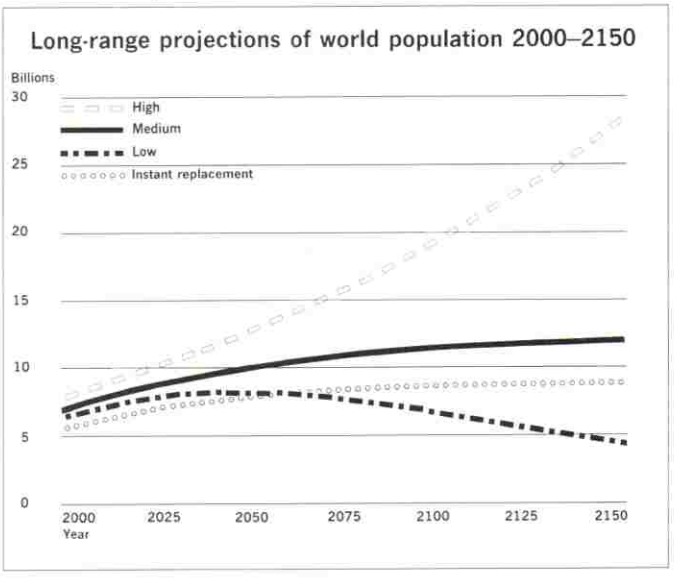
Projections

The Population Reference Bureau has published a new booklet, *The UN Long-Range Population Projections: What They Tell Us*, for policy makers. As the title suggests, the booklet helps planners make sense out of the United Nations' 1992 long-range projections, the first to be released in 10 years.

Combined with medium-range projections, the long-range projections offer planners "a foundation to better design and understand the implications of development policies." Written straightforwardly and supported by charts, tables and a glossary of basic terms, the booklet is readily accessible to a reasonably well-informed non-technical audience.

The booklets, available in English, French and Spanish, are free to readers in less developed countries and other organizations or individuals working there.

■ *Write to International Programmes, Population Reference Bureau, Inc., 1875 Connecticut Avenue, NW, Suite 520, Washington, DC 20009-5728, USA.*



Safe Motherhood

Family Health International has issued three publications and two videos, all promoting safer motherhood. These are:

Your Health, Your Pregnancy: A Guide for the African Woman by Dr A.A. Arkutu (a non-technical book suitable for local organizations).

Guidelines for Preparing a Safe Motherhood Information Campaign. (US$5.00 in North America and Europe, US$1.00 in developing countries.)

Acting to Save Women's Lives by Andrea Eschen reports on the Meeting of Partners for Safe Motherhood, held in March, 1992 at the World Bank. (No charge.)

Vital Allies: Making Motherhood Safe for the World's Women. This video provides an overview of the root causes of poor maternal health and introduces the priority issues that need to be addressed. Two versions are available. The longer version (27 minutes) includes case studies featuring Safe Motherhood projects that are proving to be effective. (Available in PAL and NTSC formats; US$15 in North America and Europe.)

Madres y Mujeres: Making Motherhood Safe (English) and *Madres y Mujeres: Logrando una Maternidad sin Riesgos* (Spanish) is the third in a series of regional videos depicting maternal health conditions in Latin America from a community-level perspective. (NTSC format only; US$ 15 North America and Europe.)

UN Award

IPPF President Dr Fred Sai is to receive the 1993 United Nations Population Award in recognition of his involvement and global leadership in family planning.

The award committee noted Dr Sai's contributions to research on nutrition, community welfare and family planning, and for his direct involvement in both national and international programmes that address the problems of high fertility throughout Africa and the developing world.

Dr Sai shares the award with the Mainichi Shimbun Population Research Council which was chosen for its achievements in creating awareness of population issues through its newspaper *Mainichi Shimbun*.

Unsafe abortion

The International Planned Parenthood Federation (IPPF) has published an issue of its twice-yearly publication *Planned Parenthood Challenges* on Unsafe Abortion.

The publication, which aims to stimulate debate and be a catalyst for action on topics of concern to the family planning movement worldwide, contains reports on the challenges posed by the prevalence of unsafe abortion in many countries, and the responses to these challenges. An overview points out that between 36 and 53 million pregnancies – about a quarter of all pregnancies – are deliberately terminated every year, many of them in countries where abortion is illegal, with almost all the 150,000 deaths caused by abortion occurring in countries with very strict abortion laws.

Writers point out that even where abortion is illegal there may be ways of providing early vacuum abortion or at least better treatment for cases of incomplete abortion caused by clandestine procedures. The magazine concludes with a checklist of ways of combating unsafe abortion. Enclosed with *Planned Parenthood Challenges* is a map of abortion legislation worldwide.

■ Planned Parenthood Challenges *1993/1 is available free of charge to family planning workers and associated individuals and organizations from IPPF Distribution Unit, Regent's College, Inner Circle, Regent's Park, London NW1 4NS, UK. The magazine is published in English only, but the map is also available in French.*

Reproductive revolution

A reproductive revolution is under way in much of the developing world and fertility is falling sharply in countries where family planning supplies and services are promoted and available, according to a new report from the Johns Hopkins School of Public Health.

In developing countries the average number of children women have in their lifetimes has fallen from six in the 1960s to four today, according to *The Reproductive Revolution: New Survey Findings*, published in the current issue of *Population Reports*. The report presents major findings from the Demographic and Health Surveys and Family Planning Surveys, which have surveyed more than 300,000 women in 44 Asian, African, and Latin American countries.

The comparable national surveys show that demand for effective methods of contraception is rising. Almost 90 per cent of women surveyed know about at least one family planning method, and in some countries a majority of married women of reproductive age use contraception. Radio and TV messages about family planning are common in many developing countries. And in most countries at least 80 per cent of married women approve of them.

Despite the dramatic change, there is still a long way to go. In developing countries outside China an average of 38 per cent of married women in developing countries – about 283 million – are using family planning compared with about 70 per cent in the developed world and China.

The percentage could be much higher in the developing world, however, if all the potential demand for family planning were met. Survey findings suggest that 120 million married women – one in every five outside China – want to avoid pregnancy but are not using contraception. Meeting this potential demand is a top priority for family planning programmes, the report states.

■ *Contact JHU/CCP at 615N Wolfe Street, Baltimore, MD 21205. Tel: (410) 955-6878, Fax: (410) 955-0258.*

Winners and losers

Indonesia, Bangladesh, Iran, Peru and Zimbabwe stand out as five countries making impressive, recent progress in expanding access to family planning services, according to Population Action International's *Population Picks and Pans* for 1992

Russia, Pakistan, Poland, Iraq and Ireland are the five countries described as having a noteworthy lack of progress.

According to the report, the doubling of contraceptive use in Bangladesh – from less than 20 per cent of couples in 1981 to 40 per cent in 1991 – is a remarkable achievement given the country's extreme poverty, high levels of illiteracy, and the low status of women. In contrast, contraceptive use is estimated at just 12 per cent of couples in Pakistan, a country that shares many of Bangladesh's economic and social characteristics.

The report is particularly critical of Russia and Poland. According to Sharon Camp, senior vice president of the research and advocacy group, women facing an unwanted pregnancy in either of these countries only have one option – abortion. In Poland, the Catholic Church has further denied women's reproductive choices by winning passage of a highly restrictive abortion law. In Russia the costs of economic transition are being borne by women whose economic position is deteriorating along with their reproductive health care.

In the five countries recognized for their progress, a strong political commitment to expand family planning services is credited with much of the success, regardless of whether services are provided by the government or by a combination of public and private sector providers.

"Governments are in a position to make a powerful difference in the reproductive lives of their citizens," says Dr Camp.

■ *Contact Population Action International, 1120 19th Street NW, Suite 550, Washington, DC 20036. Tel: 202-659- 1833. Fax: 202-293-1795.*

Guidelines

The World Health Organization has published *Female Sterilization: A guide to provision of services*. Staff members of the Association for Voluntary Surgical Contraception (AVSC) drafted the manuscript for WHO and met with experts to gather comments and suggestions.

The book is a detailed guide to the organization and management of high-quality female sterilization services. It includes seven chapters on surgical issues, including pre-operative assessment, anaesthesia, different surgical techniques, and post-operative care. Additional chapters address management and planning, information and counselling, instruments and equipment, reversal, training, record-keeping and evaluation. An annexe provides information on funding sources.

■ *Available from WHO's Distribution and Sales Office, 1211 Geneva 27, Switzerland.*

Conferences

Two conferences with environmental themes are being planned by the International Union for the Scientific Study of Population. The first, on Population and Environment in Industrialized Countries, takes place in Warsaw and Cracow, Poland, on 27-30 June, 1994. The second, on Population and the Environment in Arid Regions, will be held in Amman, Jordan on 23- 26 October, 1994.

■ *Contact Prof. John Clarke, Chairman IUSSP Committee on Population and Environment, at IUSSP headquarters in Liège, Belgium. Fax: (3241) 22.38.47.*

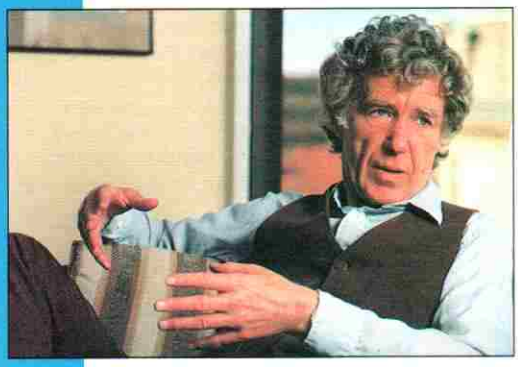
BOOKS

Ten Years On

The State of the World 1993
Worldwatch Institute
W W Norton, New York, and Earthscan, London, 1993. $10.95/£9.95 (paperback). For a list of Worldwatch titles, write to Worldwatch Institute, 1776 Massachusetts Ave., NW, Washington DC20036, USA.

The tenth edition of the Worldwatch Institute's *State of the World* report, is something of a milestone. In the ten years since this annual report on planet earth began it has achieved semi-official status. This new 1993 volume has a first printing of 100,000 copies in English, with 27 language editions.

Asked to look back at the changes he had noted over the 10 years, Worldwatch President, Lester Brown, told *People & the Planet:*



ROLF ADLER CREUTZ/TOMORROW

"On the down side, the message of each *State of the World* has, in a sense, been the same: forests are shrinking, deserts are expanding, topsoils eroding, greenhouse gases concentrating in the atmosphere, the ozone layer is depleting, the number of plant and animal species with which we share the planet is diminishing.

"We would like by now to have written a *State of the World* report that would have said, for example, that last year for the first time in our lifetime the earth's tree-cover had expanded. Or that last year population growth rates fell throughout the Third World as family planning gained momentum, holding out the hope of population stability in the not too distant future.

"Or that industrial countries are now working together and rapidly reducing the carbon emissions, again holding out the hope of one day stabilizing climate. But we are not able to write that yet. That has been one of the disappointments.

"On the plus side when people ask me about the Earth Summit, for example, I say it wasn't much of a success because the two principle initiatives, the climate treaty and the biodiversity treaty are hardly successful because the US did not sign the second one and signed the climate one only after all the goals and timetables were removed, leaving little more than a New Year Declaration.

"But the big event in 1992 was not UNCED. In my opinion it was the November election in the United States where the people elected, I think for the first time, an environmental President, certainly an environmental Vice President. This represents what I would call one of those hinge points in history. When we look back in a few years from now we may have difficulty recalling what the world was like, things will have changed so much. And already we're seeing the Clinton Administration announcing the restoration of funding for the UN Population Fund and IPPF, and moving rapidly ahead with an energy tax which is one of the most basic environmental decisions the government can take.

"So I see a lot of promise there, and I think we are going to see the United States again resume the leadership role in the world, both by example and otherwise, of moving the world toward an environmentally sustainable economic system."

Facts in focus

The World Environment 1972-1992: Two Decades of Challenge
Edited by M.K. Tolba and others
Chapman and Hall, London, 1992, on behalf of UNEP. £65 (hardback); £24.95 (paperback)

What a splendid compendium of information on every aspect of our environmental predicament. This is just the sort of data base we need to meet the challenge implicit in Tolba's front-page statement. "The problems that overwhelm us today are precisely those we failed to solve decades ago" – to which he might have added that the problems are far greater today, and we have only a fraction as much time in which to get on top of them before they get on final top of us.

Of the 24 chapters, the one that most concerns readers of this magazine is Population and Resources. Of course, all the others are super-pertinent too: one cannot single out an individual aspect of the environmental crisis and study it in isolation from the rest. (To that extent, the book would have been improved with a scattering of interlinking chapters to bind the whole together just as much as they are bound together in the world outside the window.) The chapter presents a stack of useful information on population trends with three main projections to 2150, with regional totals, with age-dependency ratios, and with much other illuminating (or shadow casting?) demographic data. There follows a series of analyses of repercussions, for example, employment: the developing world will have to generate 30 million jobs a year simply to keep up with new entrants into the labour force in the wake of past population growth, and do it off a collective economy only two-thirds as large as that of the United States, which often has difficulty in generating two million jobs a year.

There are, in addition, valuable assessments of prospects for urbanization and other forms of migration, environmental refugees, pressures on land resources and the absurdly demeaned status of women. With respect to agriculture, population pressures and environmental problems together have resulted in a degradation of the present food-production capacity such that grain yields have been increasing by only around one per cent per year for almost a decade, while population growth has remained at almost two per cent. Result, an awful lot of people becoming an awful lot hungrier, precisely at a time when farmlands are becoming less able to feed the present 5.5 billion people, let alone the additional one billion we are taking on board each decade.

The chapter concludes by emphasizing that our population-derived travails are not just a consequence of overpopulation in the South but of over-consumption in the North. In certain respects, notably ozone-layer depletion and global warming, the practices of 1.2 billion Northerners are currently more damaging than those of 4.3 billion Southerners – with consequences for people right around the world.

All in all, this chapter is as sound a review of population issues as you will find in such condensed form. Most of the critical statistics are there, and the backup analyses are fine. If only our political leaders would take half an hour to read it and digest its monumental implications.

Norman Myers

WWF Atlas of the Environment
Geoffrey Lean and Don Hinrichsen
Helicon Publishing Ltd, Oxford, 1992. £12.99 (paper), £19.99 (hardcover)

This new edition of the Atlas replaces its predecessor of the same name (published in 1990). All of the book's 200 colour maps and charts and much of the text has been updated principally from 1987-92.

This is a true geographical atlas, using world maps to convey the state of the global environment and important trends. It links all of the world's main population, environment and resource issues – from the ailment to the cure – in a way few publications do. According to the publishers, "the atlas will be updated periodically, every 3-4 years, so that it will always contain the latest information on the state of the planet." ■